

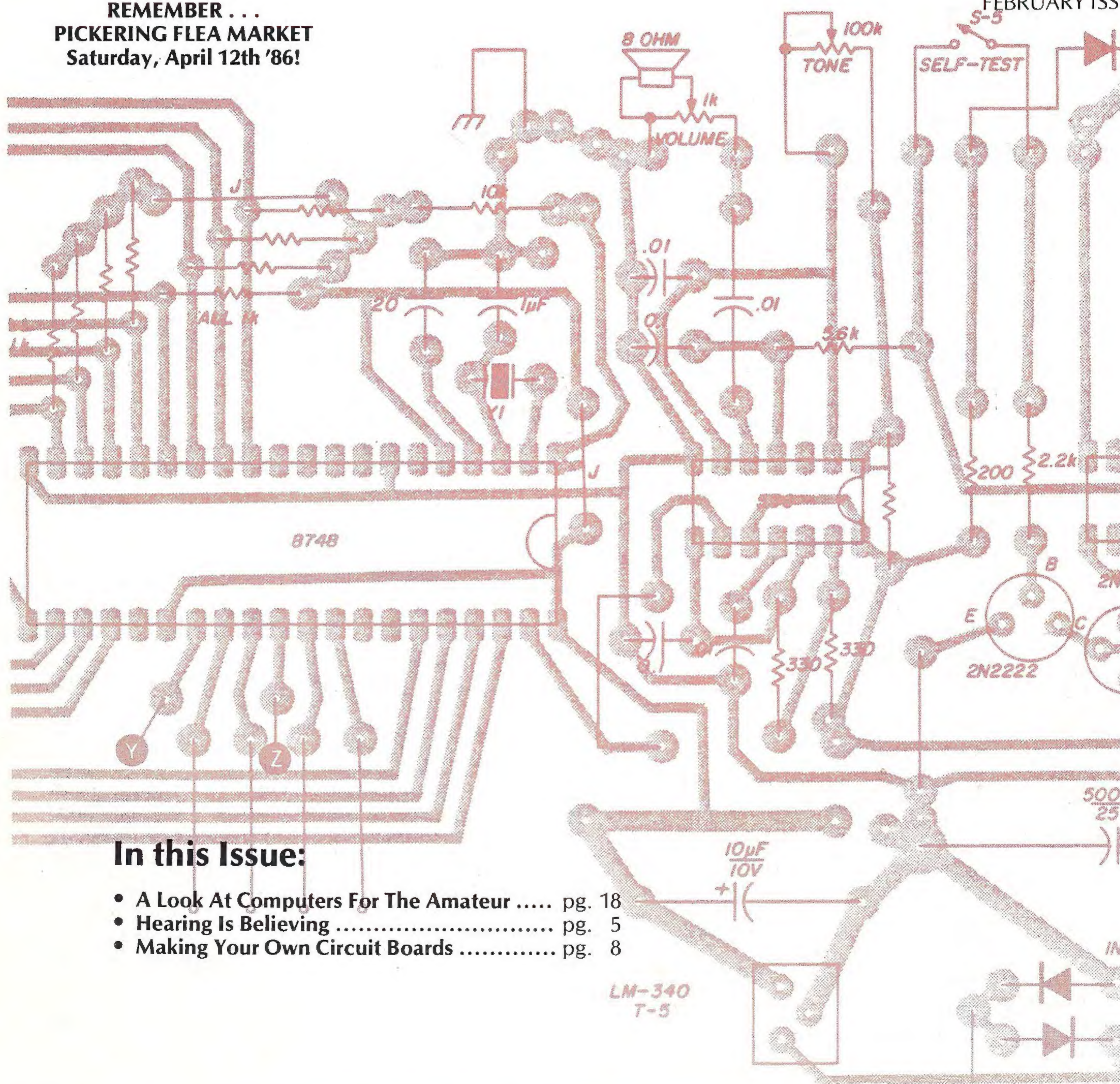
 Canada Post  
Postes Canada  
Postage paid Post paye

**First class** **Première classe**

E13548  
TORONTO, ONTARIO

**Official Journal of Radio Society of Ontario Inc.**

FEBRUARY ISSUE



- ## In this Issue:
- **A Look At Computers For The Amateur .....** pg. 18
  - **Hearing Is Believing .....** pg. 5
  - **Making Your Own Circuit Boards .....** pg. 8



# YAESU

"WHEN ONLY THE BEST WILL DO"



**FT 726 R** All Mode HF, VHF, UHF Transceiver, Microprocessor controller, Three Modes: SSB, FM, CW, Dual Meters, All Mode squelch, IF shift and width, Optional tone squelch, limited band scan.

Model	Description	Suggested List
MH-1B8	Hand-held Microphone	32.00
MD-1B8	Desk Microphone	130.00
FTE-36	Tone Encoder (31 Tones Selectable)	TBA
FTS-32R	Tone Squelch (32 Tones Selectable)	119.00
FT 726-50	Module unit for 50-54 Mhz	355.00
FT 726-144	Module Unit	264.00
FT 726-430	Module Unit for 430-440 Mhz	471.00
FT 726-440	Module Unit for 440-450 Mhz	471.00
FT 726-HF	Module 21-28 Mhz 10-15 Meters	361.00
FT 726 SAT	Module for Satellite cross-band full duplex	187.00
SP-102	External speaker w/tone controllers	96.00
SP-102p	External speaker w/tone controls and phone patch	134.00
FT 726DC	DC cable for DC operation	19.00
XF-455MC	Filter: 600 Hz CW filter	90.00

**FT 757 GX** All mode Transceiver, Dual VFO's and Eight Memory Channels, Programmable Memory Scanning CAT System, Full Duty Cycle, Full Break-in CW.

Model	Accessories	
FAS-14R	Remote Antenna Selector w/ FC 757AT	129.00
FC 757 AT	Automatic Antenna Tuner	495.00
FP-700	Power Supply w/ speaker 13.5 VDC, 20 Amps	257.00
FP-757GX	Power Supply, Switching 13.5 VDC, 20 Amps standard	284.00
FP 757HD	Power supply, heavy duty 13.5 VDC, 20 Amps	303.00
FTV 700	Monoband V/UHF Transverter(w/o band module)	215.00
FTV-6M	6M Module for FTV 700	199.00
FTV-2M	2M Module for FTV 700	270.00
FTV-70cm	430 Mhz Module for FTV 700	485.00
FIF-232c	Interface Unit for RS232c	110.00
FIF-65	Interface Unit for Apple II	91.00
FIF-80	Interface Unit for NEC	213.00
MH-1B8	Hand-held microphone	32.00
MD-1B8	Desk Microphone	130.00
SP-102	External Cabinet speaker	96.00
SP-102p	External Cabinet speaker w/ phone patch	134.00
FRB 757	Relay: Switching box for linear	17.00
FL-2100z	Linear amplifier: HF all bands 1KW	1139.00

**FT 980** All Mode HF Computer Aided Transceiver, CPU Controlled Memory System, Programmable Bands, CAT Interfacing, Compatible computer systems for NEC-PC, Apple II, and RS232c.

Model	Accessories	Suggested List
FIF 232c	Interface Unit for RS 232c	110.00
FIF 65	Interface Unit for Apple II	91.00
FIF 80	Interface Unit for NEC	213.00
MD-1B8	Desk Microphone	130.00
MH-1B8	Hand-held Microphone	32.00
SP-980	External speaker w/tone controls	146.00
SP-980P	External speaker w/tone controls with phone patch	177.00
XF8.9 GA	Filter: AM 6 Hz	59.00
XF8.9 HC	Filter: CW 600 Hz	59.00

**FRG 8800** All Mode General Coverage Receiver, 150KHz-29.999MHz, 21 button keypad, 12 internal memories, two 24 hour clocks, automatic power switching, interfacing with most computers, VHF option.

Model	Description	Suggested List
FRA 7700	Active Antenna	110.00
FRT 7700	Antenna Tuner: Freq. Range (150 Khz-30 Mhz)	92.00
FRG 8800V	Receiver with Converter installed	1058.00
FRG 8800	General Coverage Receiver	895.00
FRV 8800	Converter: VHF Freq. conv. 118-173.999 Mhz	158.00
FRG 88DC	Power Cord DC operation	8.00
YH-55	Headphones: 8 ohms Impedence	32.00
YH-77	Headphones: 6.35 mm(1/4) plus 130 cm of cable	32.00

**FRG 9600** Mode Communications Receiver 60-90MHz, VHF/UHF, full scanning, CAT, personal computer interfacing, Optional Video IF Unit available for TV reception on a video monitor.

Model	Description	Suggested List
FIF-23c	RS232c Interface for most brands	110.00
FIF-65	Interface for Apple II	91.00
FIF-80	Interface for NEC PC-8001	213.00
MMB-28	Mobile Mounting Bracket	18.00
NTSC	Video Unit	23.00
PA-4B	Wall Charger: 117VAC	21.00
PA-4C	Wall Charger: 220VAC	21.00
SP-55	External Speaker (4 ohms)	32.00
YH-55	Headphones: 8 ohms Impedence	32.00
YH-77	Headphones: 6.35 mm(1/4) plus 130 cm of cable	32.00

Contact Armaco Electronics Ltd.  
for colour brochure and  
name of your nearest **YAESU** dealer.

Imported by: **Armaco Electronics Ltd.**  
P.O. Box 24625, Station 'C'  
Vancouver, B.C. V5T 4E2  
(604) 876-4131

## Armaco

## YAESU

## Armaco



# Radio Society Of Ontario Inc.

The Ontario Amateur, published bi-monthly, is the Official Journal of the Radio Society of Ontario Inc. As one of the services of the Society, it is mailed free to members in good standing. It is printed in Canada by Seaway Printing Ltd.

To promote the interest of the amateur radio fraternity, and to improve communications between clubs and societies, material published in TOA may be reproduced in bulletins and newsletters of bona fide clubs. An appropriate acknowledgement of the source would be appreciated.

## Advertising .....

All correspondence for the RSO should be sent to: **The Radio Society Of Ontario, P.O. Box 246, Port Credit Postal Station, Mississauga, Ont. L5G 4L8.** All articles and Club News should be sent To: **Editor, Ray Pellowe VE3BAK 7 Doncliffe Drive, Toronto, Ontario M4N 2E5.** All advertising inquires or materials to: **Al Stevens VE3DQJ 21 Ida Street, Toronto, Ontario L3T 1X4.**

The Ontario Amateur is published 4 times a year.

## Get The Message?

Radio  
Society  
of Ontario



## RSO EXECUTIVE

<i>President</i> .....	Evan Herriott .....	VE3IND .....	(416) 757-4284
<i>1st Vice President</i> .....	Court Broad .....	VE3AZ .....	(416) 294-9095
<i>2nd Vice President</i> .....	John Micsinszi .....	VE3FIO .....	
<i>Treasurer</i> .....	Monty Esrock .....	VE3NBQ .....	(416) 731-5268
<i>Secretary</i> .....	Keith Bentley .....	VE3HHL .....	(416) 893-1984
<i>Delegate Co-ordinator</i> ..	Bob Chrysler .....	VE3IEL .....	(416) 291-5285
<i>Affiliated Clubs</i> .....	John Micsinszki .....	VE3FIO .....	
<i>Conventions</i> .....	Paul Cassel .....	VE3SY .....	(519) 579-6803
<i>Membership Services</i> ...	Doug Smith .....	VE3MKC .....	(705) 786-2086
<i>External Liaison</i> .....	Al Stevens .....	VE3DQJ .....	(416) 889-0295
<i>Emergency</i>			
<i>Service Co-ordinator</i>	Marion Bolechowsky.	VE3NLN .....	
<i>Communications</i> .....	Bill Birchall .....	VE3FQV .....	(519) 438-5269
<i>ONTARS Manager</i> .....	Bill Birchall .....	VE3FQV .....	(519) 438-5269

## RSO DIRECTORS

Marion Bolechowsky ..... VE3NLN  
Andy Rattray ..... VE3OIA  
Evan Herriott ..... VE3IND  
Court Broad ..... VE3AZI  
John Micsinszki ..... VE3FIO  
Ron Bell ..... VE3BDZ  
Doug Smith ..... VE3MKC

## RSO DELEGATES

### Hamilton

Fred Cross, VE3DVI, N.P.A.R.C.  
Bruce Weber, VE3ACN  
Oakville ARC  
Andrew Rattray, VE3OIA  
Brantford ARC

### Kenora

Lloyd Montgomery, VE3JYY  
John Russel, VE3JJH

### Kingston

Open for volunteers

### Kitchener

Fred Hick, VE3MTS  
SWARC  
Paul Cassel, VE3SY  
KWARC  
Bill Cruikshank, VE3NX  
Robert J. Seyler, VE3MTD  
Guelph ARC

### London

Ron Bell, VE3BDZ  
James Cooper, VE3CR  
BWARC  
Horace Jones, VE3WH  
Joe Beverley, VE3VQ  
NBARC

### Ottawa

Merv Lemke, VE3CV  
OARC  
Phil Robinson, VE3CUR

### Sault Ste. Marie

Patrick Dopson, VE3HZQ  
Sudbury, District ARC

### Thunder Bay

Open for volunteers

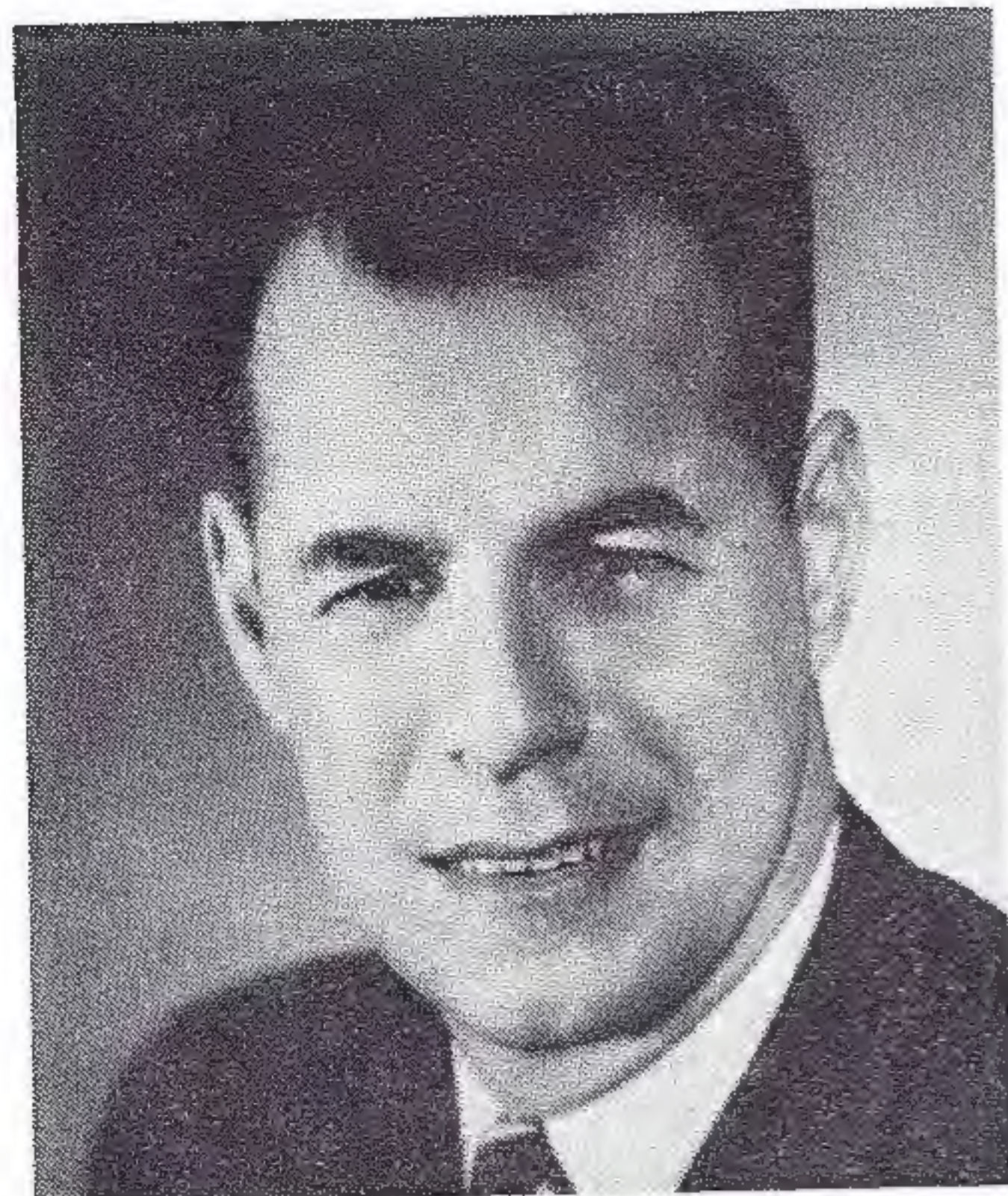
### Toronto

Bob Andrews, VE3RA  
PARC  
Libby Stevens, VE3IOT  
Thornhill ARC  
Dave Carothers, VE3MQV  
Nortown  
George Carothers, VE3ENL  
Nortown  
Paul Edgley, VE3PQ  
TFMCS  
Jean Evans, VE3DGG  
Trilliums  
Audrey Cuthbert, VE3ILT  
Bruce Carveth, VE3BC

Mike Turik, VE3BJK  
Chatham-Kent ARC







## YOUR PRESIDENT REPORTS

Hello there. Hopefully everyone (and their equipment) has survived the winter successfully. Spring is at hand, with hamfests, VE3CNE and all kinds of activities coming.

Your R.S.O. is trying hard to work for your benefit and I am very grateful for the hard-working people on the executive with me. Not all has been well though, for instance I am very sorry that we did not have our Bulletin service for several months but the system should be working again now.

We have now established communications with the Premier's office and are about to start compiling our Directory of Emergency Communications Services in Ontario. Marion (VE3NLN) your Emergency Services Co-ordinator wants it made very clear that this is NOT another new E.S. but an 'inventory' of existing services. Providing this for the Provincial government we expect will lead to more benefits (such as a reduced licence plate fee as already obtained) from the government.

Our date reflects the results from the R.S.O. club questionnaires, as well as other sources. If your club didn't get one let one of the executive, or delegates know. Be sure to have your club file their information. We can't use it if we don't have it.

Al (VE3DQJ) and Ray (VE3BAK) have been hard at work on this magazine - I hope you approve. Please send us your comments.

On your behalf, I have been honoured by participating in a teleconference and addressing several

clubs concerning the D.O.C. licensing proposals. If you haven't seen them get a copy from them (or us). From what I have heard, most people want to make it easier and more attractive for interested persons to enter Amateur Radio.

BUT! new hams MUST EARN that privilege in some way; many say by a minimum code proficiency. Also that electronic and computer enthusiasts should be encouraged; and that two age groups particularly - teen-agers and post war 'baby boomers' - are also encouraged.

### WHAT IS YOUR OPINION????

Everyone, especially clubs, should send their considered, written opinion to D.O.C. (and PLEASE A COPY TO R.S.O.) The Director General, Radio Regulatory Branch, 300 Slater St., OTTAWA, Ont., K1A 0C8.

It seems we are only just finding out what this job is all about. Hopefully you approve. Our main objective is to have R.S.O. be an association of Ontario hams working for ALL ONTARIO hams. Until the next time.

73 Evan VE3IND

**PATRONIZE OUR  
ADVERTISERS.  
WITHOUT THEM YOU  
WOULDN'T BE READING  
THIS**

## LETTERS TO THE EDITOR JACK RAVENSCROFT CASE

By this time everyone realizes the importance of the outcome of this case to the users of amateur radio and other frequencies.

If you have not sent in a donation to this fund, please do so. Just put yourself in Jack's position and I think you will understand how much the monetary and moral support means to Jack.

Mail your cheque to:

Jack Ravenscroft RF  
Susceptibility Defence Fund  
P.O. Box 8873,  
OTTAWA, Ontario  
K1G 3J2

## "BESTE HILSEN" FRA NORGE!

"Best regards" from Norway, was a word I hoped to be able to pass along to a Canadian ham when I tried without success to have a DX QSO from Oslo, Norway in early November. During a five-week study project I thought it would be great to contact someone in southern Ontario for a phone-patch contact with loved ones back home. So I telephoned the NORSK RADIO RELOA LIGA office, found out that the Oslo club met every Wednesday, made quick (and slightly rule-bending!) contact with the Norwegian Telecommunications Administration (they usually require an advance request by mail) for authorization to work a Norwegian station, received the suffix LA to put on the end of my call, and was at the Oslo club station the same evening. The temporary licence cost 90 kroner, which is about \$16.00, and for several hours I used their rig, a Kenwood TS-830S. I sent out cq's to no avail, but I did monitor one DX communication which a ham in Great Britain was having with Spencer, VE3SW, at a station somewhere north of Toronto. After they had terminated, I tried to reach VE3SW, but conditions were not good enough. An old-timer told me that 5.00 hours was the best time for a contact with Canada on 20 meters, but I didn't think the "lock-up" man would appreciate my asking him to let me stay till the small hours of the next morning!

The Oslo hams were a splendid group, and their Wednesday meetings alternate between business and social events. The age spread is under 16 to over 80; like the ham tradition at its best, amateur radio in Norway is for everyone. So, even though I did not have a chance to use my very limited knowledge of Norwegian in a QSO, I am pleased to bring greetings from LA40 - the Oslo-gruppen av NRRL. "Beste hilsen" fra Norge!

MORTON PATTERSON - VE3KOT  
Burlington, Ontario



## A RELATIVE READING MICROMETER FOR THE VISUALLY HANDICAPPED

BEFORE BUILDING THIS UNIT PLEASE READ THE ARTICLE ENTITLED "PLAY IT SAFE" WHICH IS FOUND IN THIS ISSUE - Ed.

No doubt, if you listen in on 75 metres at all, you have recently overheard discussions with Jim, VE3BME, regarding some "device" for his shop that has been in the fiddling stage for some time. Now TOA has the scoop on what it is all about! For years Jim has needed a device for his lathe which would be capable of measuring thousandths of an inch. A micrometer is the obvious solution, but suppose the operator of the lathe is unable to read the dial on the instrument? While the device presented here cannot make actual measurements, it will give a plain audio indication of changes of several thousandths of an inch. I doubt that there will be an overwhelming need for a device such as this; however, the principal of operation may very well stimulate someone else's imagination in the direction of other applications or uses.

The device contains several sections that are in everyday use in amateur equipment, or may be built separately and used for other purposes. Best of all, parts are readily available. I am a firm believer in scrounging parts, and this Relative Reading Micrometer can probably be built from parts removed from one old automotive radio.

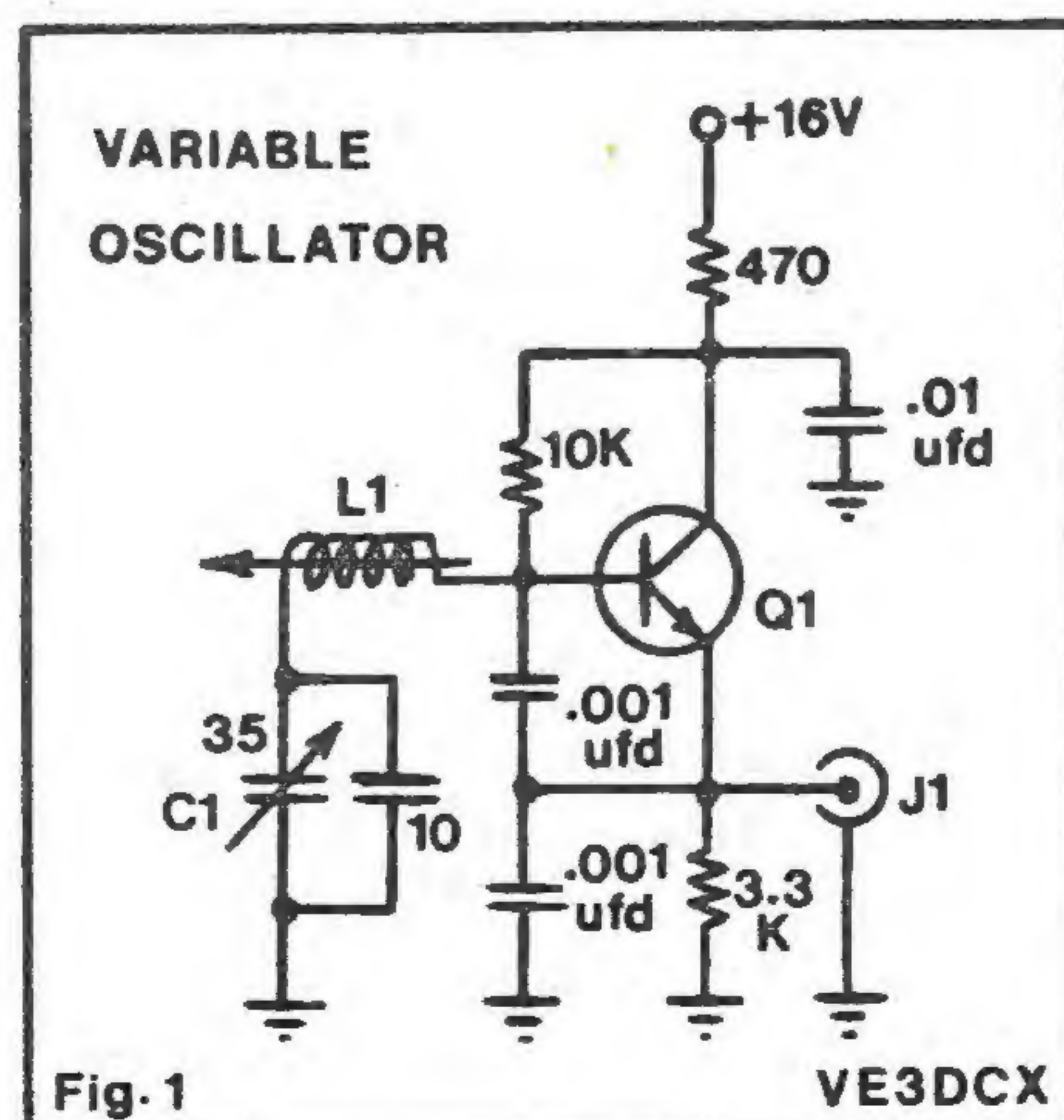
So, let's discuss the general principles of operation and then look at the circuit in blocks to understand the way it functions.

The usual micrometer is composed of a gauge calibrated in thousandths of an inch. Protruding from the gauge is a feeler intended to "ride" on the work being measured. In a lathe, the material being worked is rotated with the feeler riding on the material itself. The gauge will then measure out-of-roundness of the work as it rotates. When the operator's sight is not good enough to read the micrometer's scale, he or she has a problem.

The device being discussed here has the feeler coupled to the slug of a coil which is part of a radio frequency oscillator. The tone is about 1MHz. As the feeler moves ever so slightly on the work, the slug moves inside the coil and changes the frequency of the oscillator. This signal is then mixed with the signal from a 1 MHz crystal oscillator. As you will recall, when two signals are mixed together, the end result is four signals: the two originals, the sum of the two, and the difference between the two. As the two signals in our unit are so close together, the difference is an audio signal which we can hear. Obviously, if the feeler is changing the oscillator frequency, the audio tone will change corresponding to the change in difference between the crystal standard and the oscillator frequency. Therefore, measurements normally observed on a gauge can not be heard as a changing tone.

### THE VARIABLE OSCILLATOR (see figure 1.)

This circuit is the standard series tuned colpitts oscillator configuration which is used in many VFO circuits. In fact, with slight changes, this circuit can be used as a 160 meter band VFO in a QRP rig. Two acceptable methods of changing the frequency of oscillation are (1) capacitor tuning, or (2) slug tuning the coil. In our device a capacitor tunes the circuit so that it oscillates near 1 MHz, and then the coil is tuned by the slug to accomplish measurements. Refer to Fig. 3 for the mechanical construction details of the feeler and coil assembly. The



oscillator circuit of Fig. 1 is wired on a small piece of "perf board" and mounted alongside the coil. This was mounted in one case with cables connecting the oscillator unit to the rest of the circuit and the Power Supply which were mounted in another case.

The case we used for the oscillator is pictured in Fig. 3. It is a small brass cavity made by Sinclair, Model H150. It was purchased at a flea market. This particular item is made up of a brass sleeve about the same size as a cardboard toilet paper roll centre, and it has brass plugs which fit into the ends of the cylinder and are held in place with screws. The cylinder is about 1 1/4 inches in diameter and about 6 inches long. The components are mounted on the end plugs as shown in Fig. 3. Any rigid case can be used by the builder; however, it should be of all-metal construction for shielding purposes.

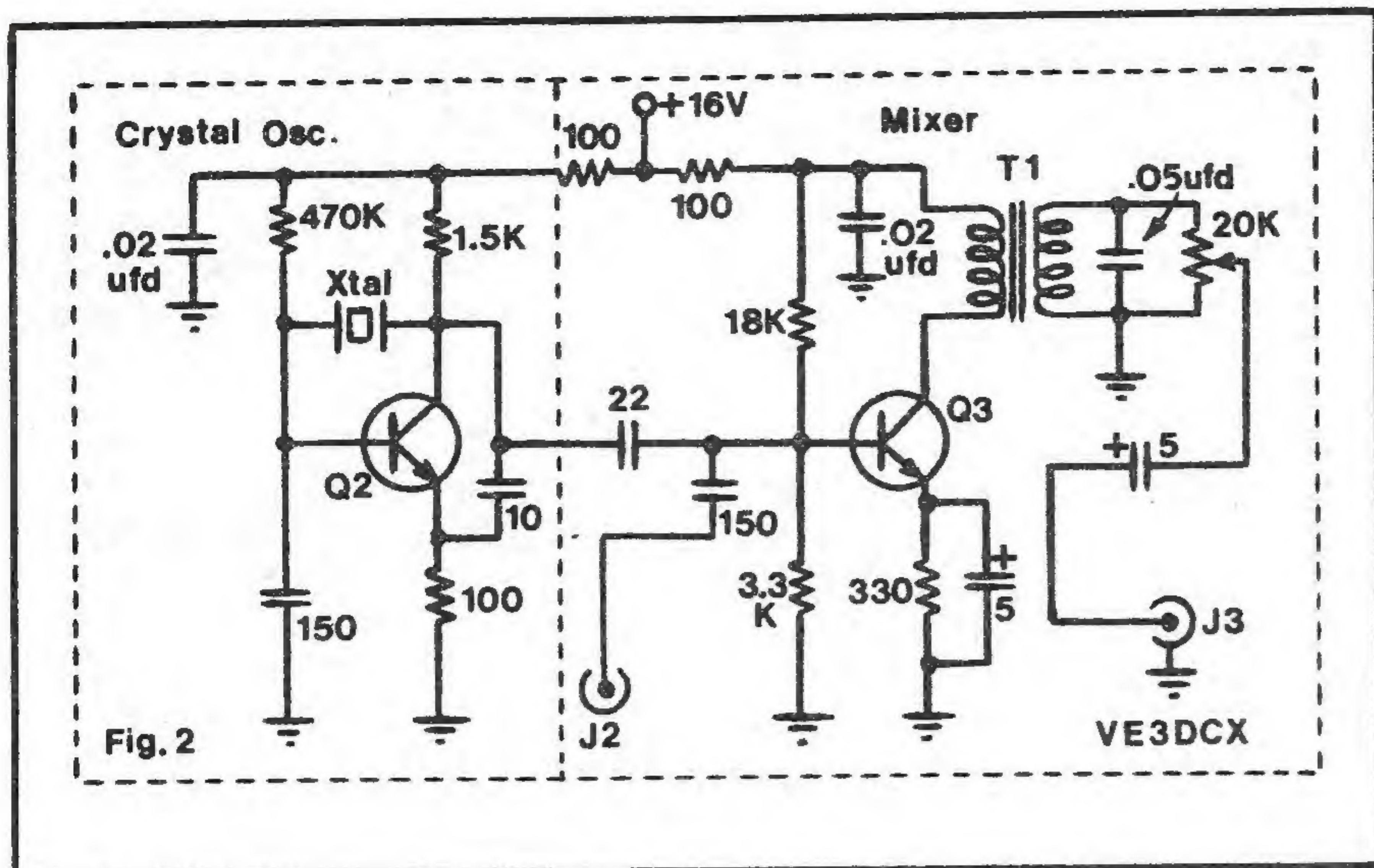
The coil L1 is unique. It is a slug tuned inductor removed from an old automotive radio. In most of these receivers there are 3 such coils mounted together, sometimes in the same container. Usually the container is made of lead, and one coil can be removed from the others using a hacksaw. I recommend using one of the two RF amplifier coils. They can be distinguished from the oscillator coil which usually has more than one winding. Disassemble one of the RF amplifier coils and mount as shown in Fig. 3. As you can see the coil slug is secured in the end of the feeler, and any in and out motion of the feeler results in movement of the coil slug, and hence changes the frequency of the oscillator. The output from the oscillator is routed through J1 and via a coaxial cable to the mixer stage in Fig. 2.

### CRYSTAL OSCILLATOR

This is a simple untuned crystal oscillator circuit which will oscillate reliably over a large range of crystal frequencies. In this application we are using a 1 MHz crystal. This particular circuit has other practical uses. It can be used to test surplus crystals, or substitute Q2 with a socket and use it to test transistors.

..... continued page 6





As a transistor checker, choose a low frequency crystal (1 MHz is fine). If the circuit is oscillating you can hear it on an ordinary broadcast band receiver placed nearby. Adding a switch to reverse the power supply polarity will enable you to check PNP transistors. The circuit could also be used as a crystal calibrator, or a frequency spotter.

To do this, build the portion of Fig. 2 to the left of the dotted line (the circuitry surrounding Q2). The 22pF capacitor can be used and is connected to the collector of Q2. The other end of the capacitor should be connected to a small whip or a short piece of wire in order to radiate a small amount of signal. In order to use as a frequency spotter it will be necessary to order a crystal (see ads in this magazine) cut for the fre-

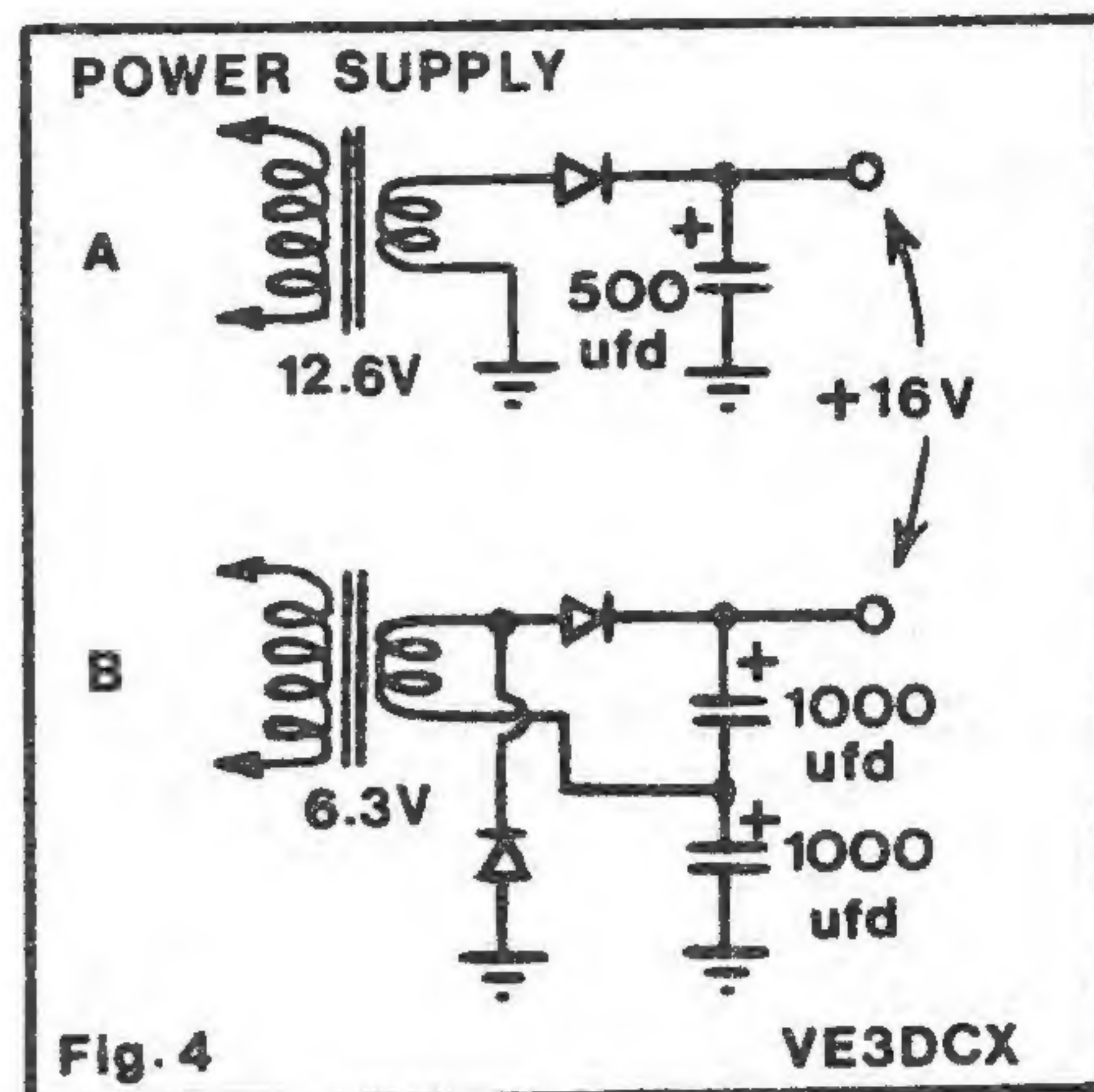
quency that you wish to spot on your radio dial. If you are like me and do not have the luxury of a digital dial, and the old mechanical dial is close but not right on, it is difficult to put this right on a specific frequency. Anyone who does a bit of net controlling on ONTARS will soon learn if they are not on the net frequency! Then, if you accidentally knock the dial, how do you get back to the net? Build this circuit, and order a crystal for 3.755 MHz. Then with the crystal oscillating, zero beat the crystal frequency with your transceiver, and you will be right on frequency.

A white canner may wish to have a crystal for 3.725 MHz to point out the bottom end of the 75 meter phone band. Even the RTTY enthusiast without the luxury of a frequency

counter can purchase a crystal for his or her favourite autostart frequency and set the rig to call up the autostart first time, every time.

With appropriate ham band crystals it can be used as a weak signal source for receiver alignment, or for antenna adjustment.

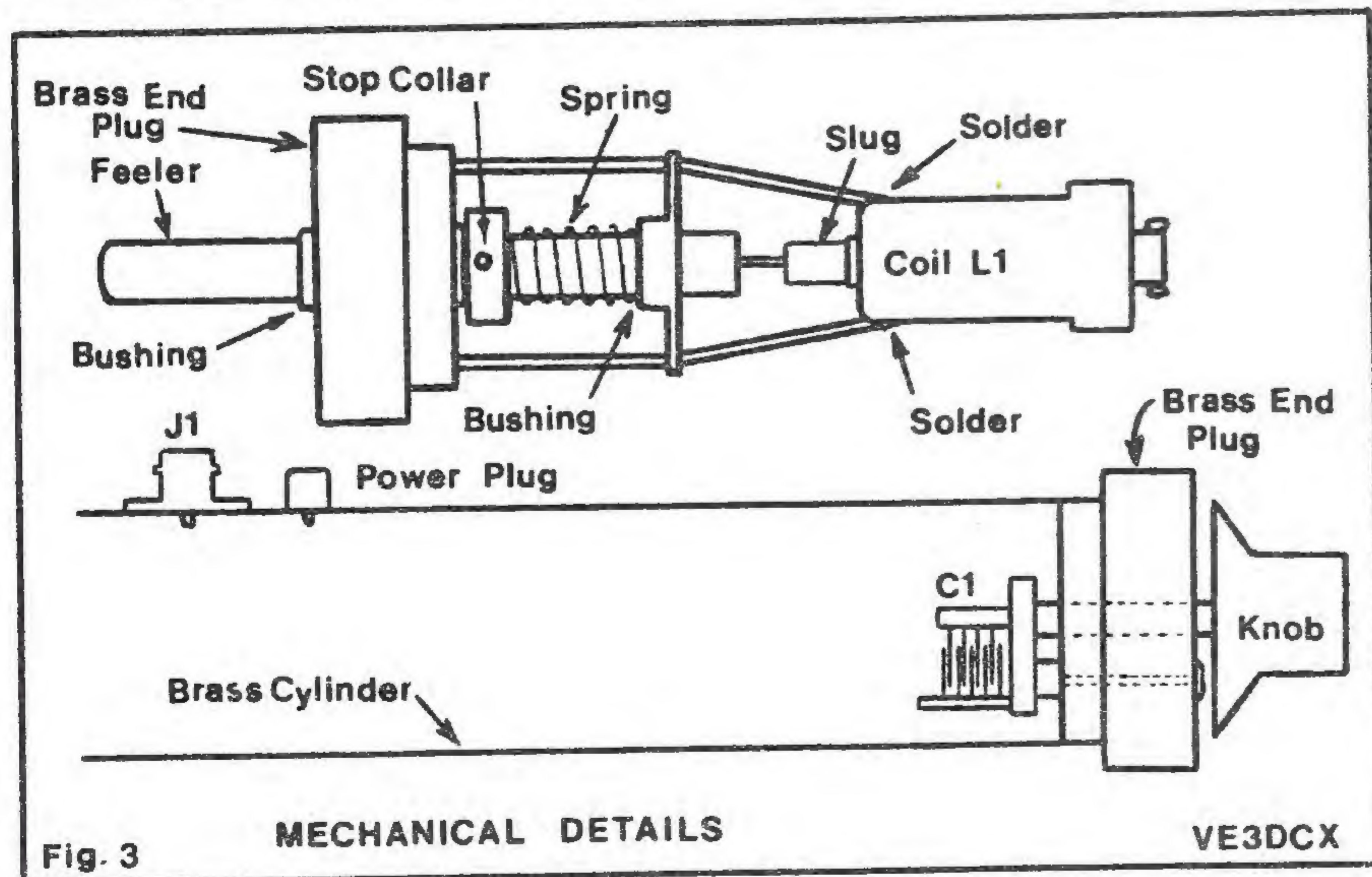
For our device it generates a stable 1 MHz signal to mix with the signal from the variable oscillator unit.



## MIXER

There is nothing fancy about this mixer circuit at all. In fact, it is not particularly efficient. For our purposes, though, it is very simple and "fills the bill" very nicely. The two signals are presented to the base of Q3 and the audio frequency resulting from this mixing is presented to T1. This transformer is a small audio interstage transformer removed from a small transistor radio. (You can buy these radios for \$3.99 at various outlets). The audio passes through a variable resistor to J3. About .5V peak to peak audio signal will be available at J3 when the variable resistor is set for maximum output. Any simple audio amplifier and speaker will raise this to room volume.

To use the unit, the oscillator unit is mounted so that the feeler is riding on the work being measured. The unit is turned on and C1 is turned until the beat note can be heard in the speaker. Then, as the work is rotated, any variations measured by the feeler will be heard as changes in the note (its pitch or frequency). This set-up is so sensitive that changes of several thousandths of an inch can



MECHANICAL DETAILS

..... continued page 12

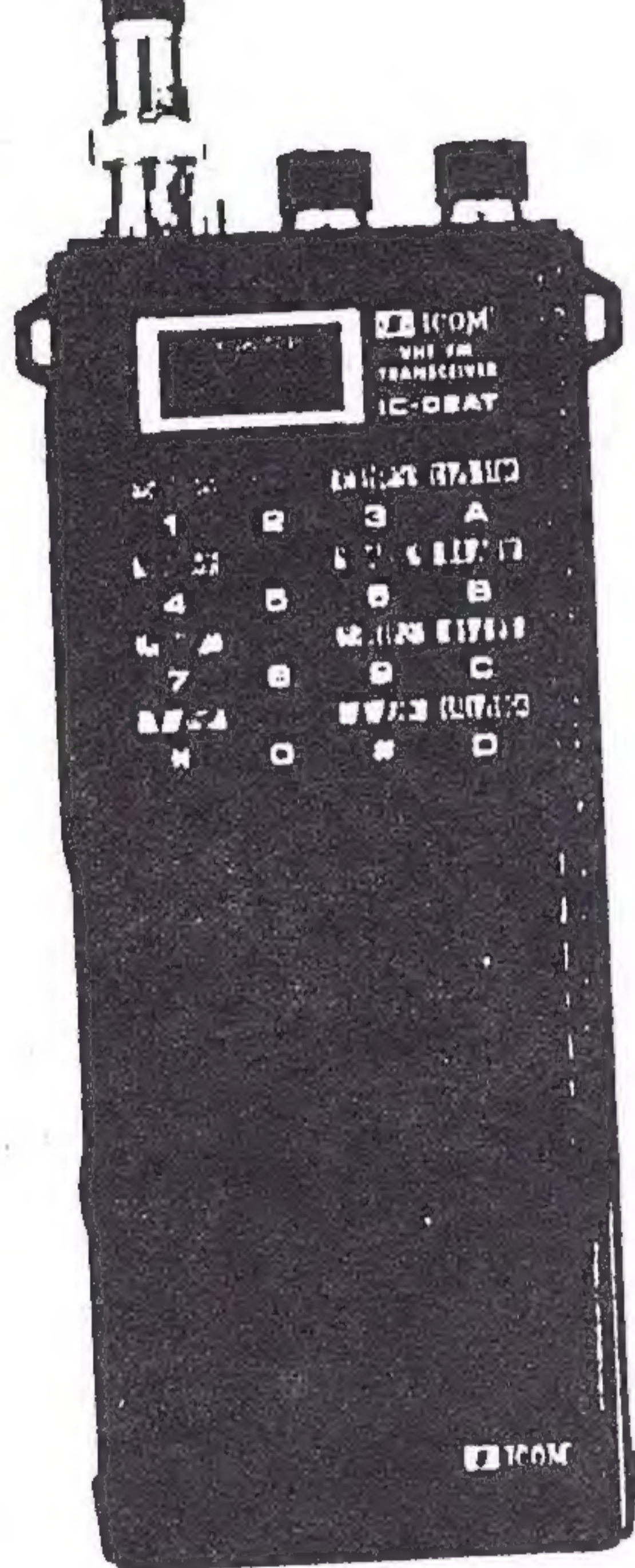


**ANNOUNCING:**

**KENWOOD**



**YAESU**



We have expanded to our new, larger location at -

8100-H Trans-Canada Hwy.

Ville St. Laurent

H4S 1M5

(514)-336-2423

And -

We have a new, toll-free number, for orders only,  
from Ontario and the Maritimes, including Newfoundland

1-800 - 361 - 6979

Now open to serve you -

Tuesday - Saturday 9:00 to 5:00,  
closed Monday

**Authorized Icom Warranty Service Center**

*Spécialistes en Communications / Communication Specialists*

8100-H Trans-Canada Hwy., St-Laurent, Qué. H4S 1M5 (514) 336-2423; 1-800-361-6979

**Hobbytronique Inc.**



# Printed Circuit Boards

## HOME PRODUCTION OF HIGH QUALITY PHOTO-ETCHED PRINTED CIRCUIT BOARDS

by Jim Eadie, VE3DCX

For ten years I have been producing printed circuit boards using various kits, chemicals and processes with varying degrees of success and failure.

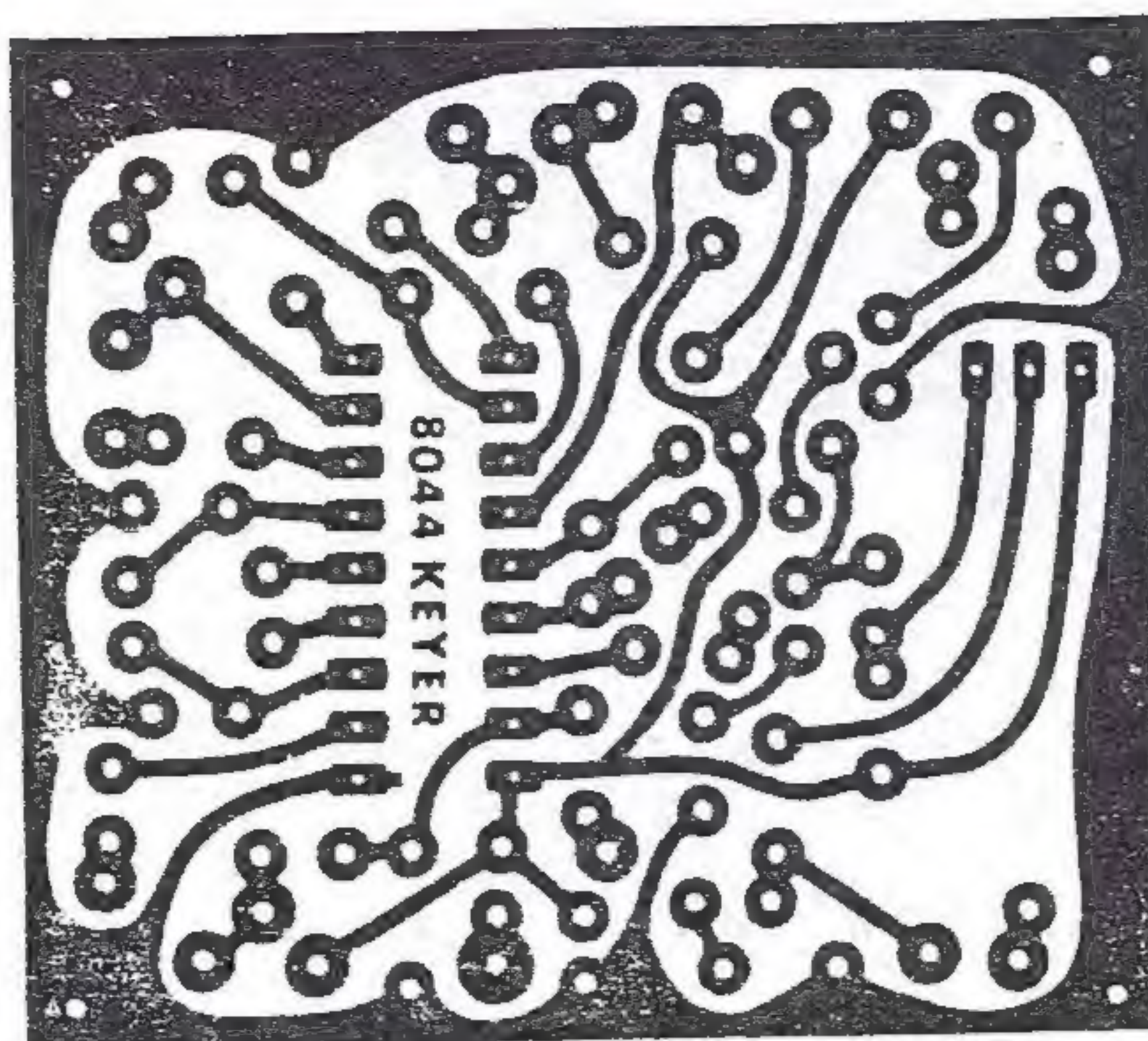
(Please read "Play it Safe" elsewhere in this magazine before doing this project. - Ed.)

I have discovered that reliable production of surprisingly high quality printed circuit boards can be done very inexpensively and simply, right from the kitchen sink. The method I use is the positive process, and there are several reasons why. First of all, the preparation of artwork is simplified and second, the chemicals are cheaper. In addition, I have noted that for some reason the positive chemicals I use produce the most reliable, and error-tolerant results.

Let's review the process quickly, and then we will go through it step-by-step. A piece of copperclad board is sensitized with a light-sensitive laquer. When the laquer is dry, the artwork is placed on top of the sensitized board and exposed to strong light. The artwork is the pattern that you wish to etch onto the copperclad. In the positive process the pattern is opaque on clear plastic or film. When exposed to light, the laquer on the copperclad will wash off when placed in a suitable developer solution leaving the copper bare. The laquer under the opaque pattern areas remains on the board. The board is now placed into the etchant solution where the exposed copper is "eaten" off by the etchant. The original artwork pattern now appears duplicated in copper on the board. Now for the details!

### SENSITIZING THE COPPERCLAD

Cut the copperclad to the required size, or larger. Before doing anything, make sure to smooth the edges with a fine file. The copper side must be very clean, and the best procedure involves hot water, an abrasive cleaner (e.g., Comet), steel



wool and lots of elbow grease. Scrub until the copper is bright and shining, and then rinse thoroughly. When drying the board be sure to use some type of line-free cloth. Once the board is dry, the light sensitive laquer can be applied. The best laquer I have found is the POSITIVE ACTING PHOTO RESIST MANUFACTURED AND DISTRIBUTED BY Trumble Co., of El Cerrito, California. A 4 oz. bottle is worth about \$15.00, and after using the same bottle to make dozens of boards it is still more than three-quarters full. This laquer is not terribly light sensitive and can be applied without problems in subdued room light (no sunlight!). The laquer is applied with a small paint brush, and some care should be taken to paint it on thinly, and as evenly as possible. Do not paint too vigorously, as it will bubble a bit. If bubbles do form during the painting, they can be brushed off. Once painted, place the boards in a darkened location to dry, and cover with a box or similar item to prevent dust from settling on them. They will take about 24 hours to dry; however, I understand they can be dried quickly under an ordinary heat lamp.

### PREPARING THE ARTWORK

Home designed layouts can be prepared from commercially available artwork. This is a subject in itself and will not be pursued at length here. The opaque artwork is applied to clear plastic to make a photographic positive. I would recommend buying the thinnest sheet you can find. The best plastic I have found is sold in most department stores as plastic covers for pages in a binder.

Most will be wanting to duplicate artwork already prepared and appear-

ring along with magazine articles. If you have a darkroom equipped with an enlarger, as I have, here is a method I have used. Photograph the artwork on 35 mm. black and white film, then expose the negative through the enlarger onto a sheet of lithographic film through a high contrast filter. The graphic arts film is then developed and makes an excellent photographic positive. In addition, contact prints can be made using your homemade artwork and the graphic arts film, so the original can be disassembled and the art patterns reused.

The majority of readers will use the following method. Most photocopiers for copying on paper will also copy onto overhead projector plastic. Schools use this method to prepare overhead projector material. Place the magazine page on the copier and copy onto a sheet of overhead projector plastic, and presto, an excellent photographic positive!

### EXPOSING THE BOARD

The dry board is still relatively insensitive to subdued room light. Tape the board (copper side up!) to a piece of stiff cardboard, or light wood paneling material. Place the artwork directly on top of the board making sure it is right side up, and tape the artwork in place so that it doesn't slip. Then place a piece of glass on top so that the board and artwork are tightly "sandwiched" between the glass and the cardboard. Now to expose the board, simply walk outside and hold it up to the sun. Don't let your fingers get in the way of the sunlight! The exposure time is about 2 minutes in bright sunlight.

There is one problem I have discovered using sunlight that is easily remedied. Sunlight reflected around outside tends to get under the artwork and make the edges ragged. The solution is to allow only sunlight coming directly from the sun to shine on the board. I constructed a "chimney" out of black paper which is taped to the front of the glass which only allows direct sunlight to shine on the board. With a chimney the resulting copper pattern is extremely sharp and accurate.

..... continued page 9



## DEVELOPING THE BOARD

The developer solution for the laquer I specified can be mixed up using chemicals probably already in your kitchen. Add about 2 heaping tablespoons of household lye to a half pint of water. Add the lye VERY SLOWLY as it reacts violently when mixed with water. The water will become very hot so mix this preparation in advance. Remove the exposed board from the "sandwich" and gently put it into the solution copper side up. Agitate the dish, and you will notice the laquer that was exposed to light will turn slightly purple and start to wash off. Continue to agitate until most of the exposed laquer is washed off. Remove the board and rub the board under running water with a soft cloth or paper towel. Any remaining exposed laquer will rub off quite easily. You will note the laquer which was hidden under the opaque artwork at the time of exposure remains hard and clings to the board tightly. The board is now ready to etch.

## ETCHING

There are a number of chemicals used to etch copper. My experience is limited to ferric chloride. It is available as a pre-mixed liquid, or as a powder. When mixing powder with water, be sure to follow the directions carefully as ferric chloride also reacts violently with water. Use ONLY glass or plastic containers to store and handle ferric chloride as it will eat holes in metal, very rapidly. Don't pour into the sink, or spill on your clothes for obvious reasons. Place the board into the etchant, and the exposed copper will be removed from the board. This takes from 30 minutes to one hour, but there are several means by which you can speed up the process.

Agitate the dish continuously during the etching, and it will etch much faster. If the ferric chloride is heated, it will work faster. I use a goose-neck lamp bent over and shining into the dish to warm the etchant. The quickest method of all is to bubble etch. My bubble etch system is easy to duplicate and the required equipment can be purchased at a yard sale. At least, mine

was. Use a small aquarium air compressor and bubble stone. Turn on the little pump and place the bubble stone into the etchant solution. The etchant will froth up on the surface. Suspend the exposed board copper side down into the froth, not into the liquid. I hold the board in place with a rubber suction cup removed from a toy gun projectile. Heat the etchant a little, and the process will be very fast. Best of all, no manual labour is required! Once etching is complete, rinse the board thoroughly in water to remove all the ferric chloride, and dry it.

## FINISHING UP

The laquer on the remaining copper pattern can be easily removed with nail polish remover. Scrub the board again vigorously with steel wool and water until it is bright again. The board is now ready to drill in preparation for the mounting of components.

I hope you will enjoy doing the projects offered in this issue. Remember the need for adequate ventilation!  
'73, Jim.

## REMINDER

The D.O.C. wants **YOUR** comments about the proposed changes.

If you are not in favour of them, your objection must be accompanied by an alternative proposal and supporting arguments.

Send a copy of your submission to RSO, CARF, and CRRL.

***This is Important.***

## THANKS, GEORGE

During the autumn of 1985, George Collins, VE3FXT, visited several countries in Africa. While there, he combined business with pleasure and was on the air pretty well every afternoon E.D.T. Many amateurs were able to make contact with new countries as a result of George's willingness to answer all calls.

QSL cards were sent out promptly and this efficiency was appreciated by all recipients.

Thanks, George.

## SCARBOROUGH AMATEUR RADIO CLUB 40th ANNIVERSARY AWARD

To qualify for this award you require 40 points to correspond with the 40th anniversary.

### For Canadian Stations:

1. Contact 20 VE3 stations and 20 other VE, VY1, VO stations from the remaining Canadian Provinces and Territories (40 points). Contact with each station counts 1 point.
2. Count five bonus points for contact with a special Canadian prefix station or a Scarborough A.R.C. member's station. Ten points for contact with the Scarborough A.R.C. station VE3WE.

### For U.S.A. and DX:

One contact is equal to 2 points and bonus points are doubled.

ALL CONTACTS MUST BE MADE DURING 1986 ONLY.  
ONLY ONE CONTACT FOR EACH STATION  
AVAILABLE TO LICENSED AMATEURS AND SWL'S.

To receive the award send a copy of your log signed by two amateurs and \$1.00 or 3 I.R.C.'s to:

Scarborough Amateur Radio Club Inc.,  
Awards Chairman  
P.O. Box 174, Station "D",  
Scarborough, Ontario, Canada  
M1R 3C0

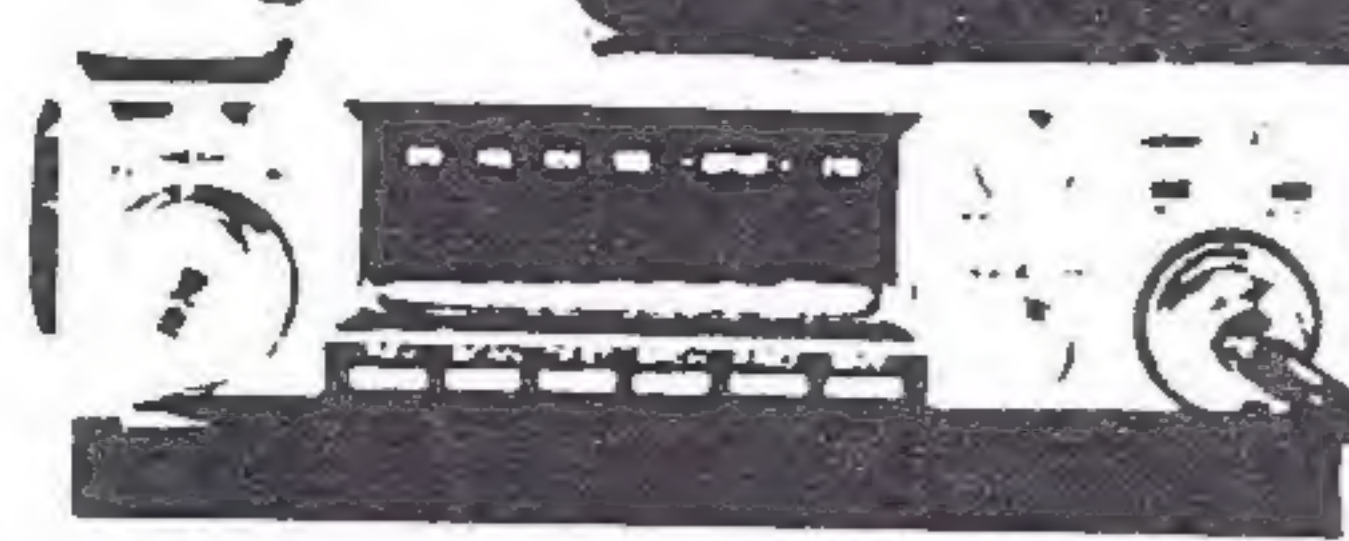


## KDK The New FM-240 for 2-Meters

With the  
User Friendly

**MMI**  
Mini Machine  
Interface

List Price \$579



The KDK FM-240 features:

- 25-watts of power (5-watts in Low power)
- 16 memory channels plus one priority channel
- Automatic offset programming standard and oddball
- Easy to see Alpha-numeric LCD readout system
- Simple tuning & programming-nothing complicated
- 16-position touchtone pad mounted on speaker/mike
- Up/Down tune, and lock switches on speaker/mike
- Programmable sub-audible tone ENCODE and DECODE

There is NO OTHER Transceiver  
On the Market Today that can  
Surpass the KDK FM-240 in size,  
features, and Price! NONE!

SPECIAL PRICE \$449.00

Voice Synth Option \$59

Special on External Speaker  
with FM-240 \$10.00

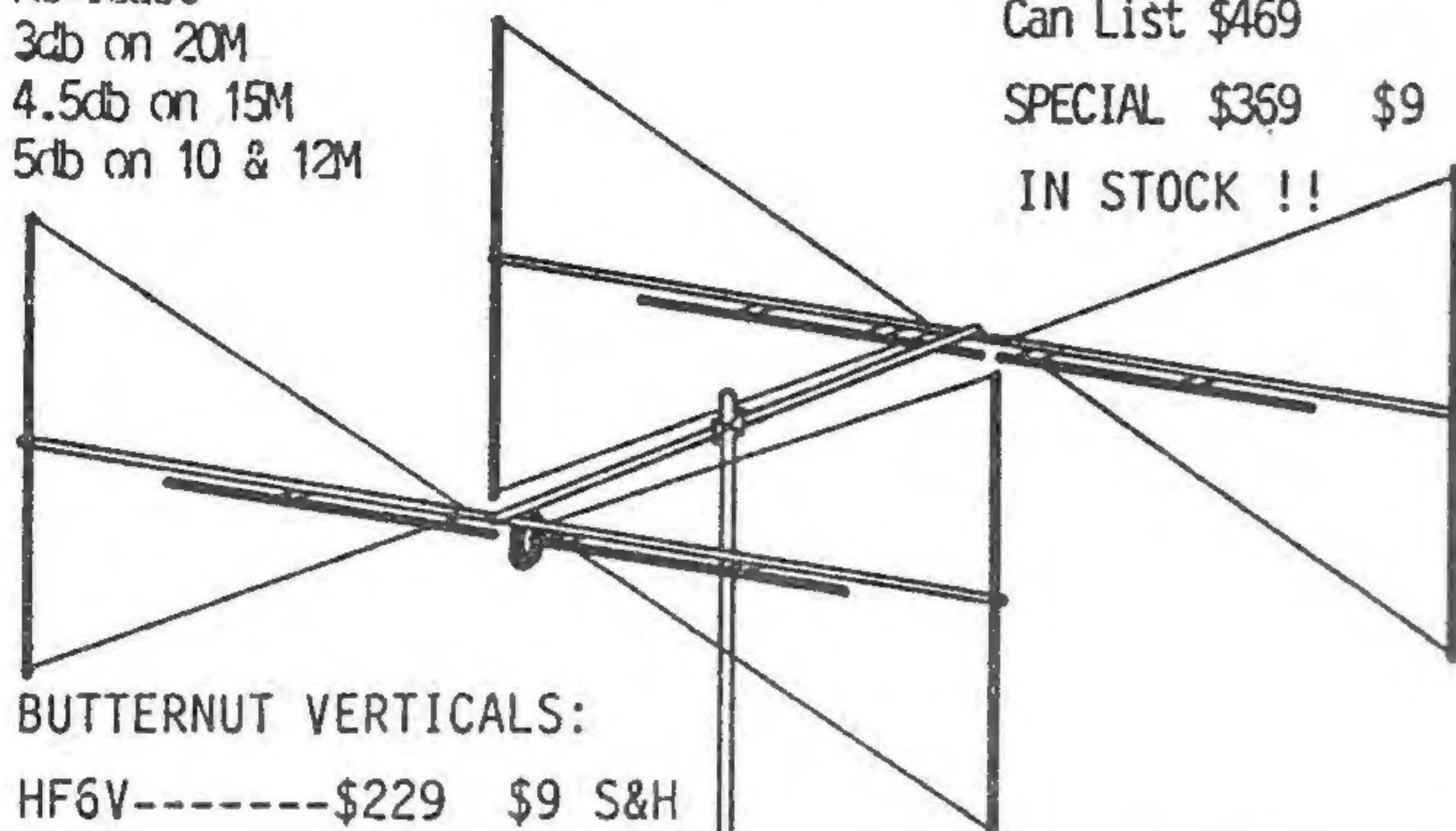
Mode of scan can be pro-  
grammed with EACH  
MEMORY.....

\$449.00

- Optional Voice Synthesized module-easily plugs in
- Four modes of scan-manual, timed, stop/slay & stop/resume
- Comes with mobile bracket, speaker microphone, power cord and easy-to-read operating instructions.
- Features 90-day warranty
- Compact. Measures approx: 1-1/2H x 5-1/2W x 6-5/8D (inches)
- Covers 2-meter band, plus CAP and MARS

## Introducing the BUTTERFLY™ Beam from Butternut!

Gain:  
At least  
3db on 20M  
4.5db on 15M  
5db on 10 & 12M



Can List \$469

SPECIAL \$369 \$9

IN STOCK !!

### BUTTERNUT VERTICALS:

HF6V-----	\$229	\$9	S&H
HF2V-----	\$219	9	
TBR-160----	\$ 99	3	
RMK-II-----	\$ 99	6	

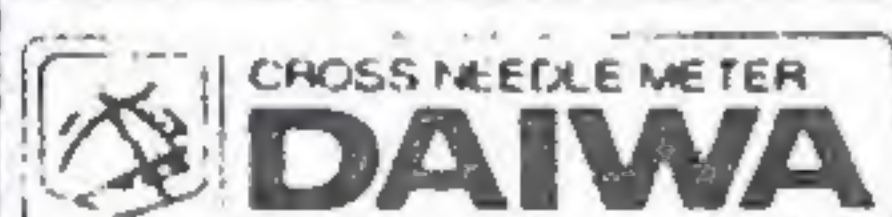
The HF4B Compact, 2-element  
Beam for 20-15-12-10 meters

### Compact Size

The HF4B's 12 1/2-foot elements and 6-foot boom are ideal for home-station use and for weekend retreats, condos, apartments and other places where oversized beams are prohibited. Its light weight (17 pounds) means it can be turned with a tv rotator, yet it is robustly constructed in the best tradition of our world-famous Butternut verticals.

### Performance

The HF4B BUTTERFLY™ has not sacrificed performance for compactness. Its unique design with fanned elements and L-C circuits avoids use of power-robbing traps yet provided high-efficiency operating on all bands. The BUTTERFLY™ outperforms anything in its class.



### DAIWA HAM EQUIPMENT:

#### METERS:

CN-520 1.8-60MHz 200/2kW--\$ 99.95	CN-540 50-150MHz 20/200W\$119.95
CN-620B 1.8-150 20/200/2kW\$169.95	CN-650N 1.2-2.5GHz 2/20W\$319.95
CN-630 140-450MHz 20/200W--\$229.95	CN-630N with N Connector\$259.95

#### LINEAR AMPLIFIERS FOR HANDHELDS:

LA-2035 3 watts in 30 out--\$119.95	LA-2035R 5W-30W Preamp--\$139.95
LA-4030 3W-35W for 440MHz--\$239.95	

#### CAVITY CONSTRUCTION COAXIAL SWITCHES:

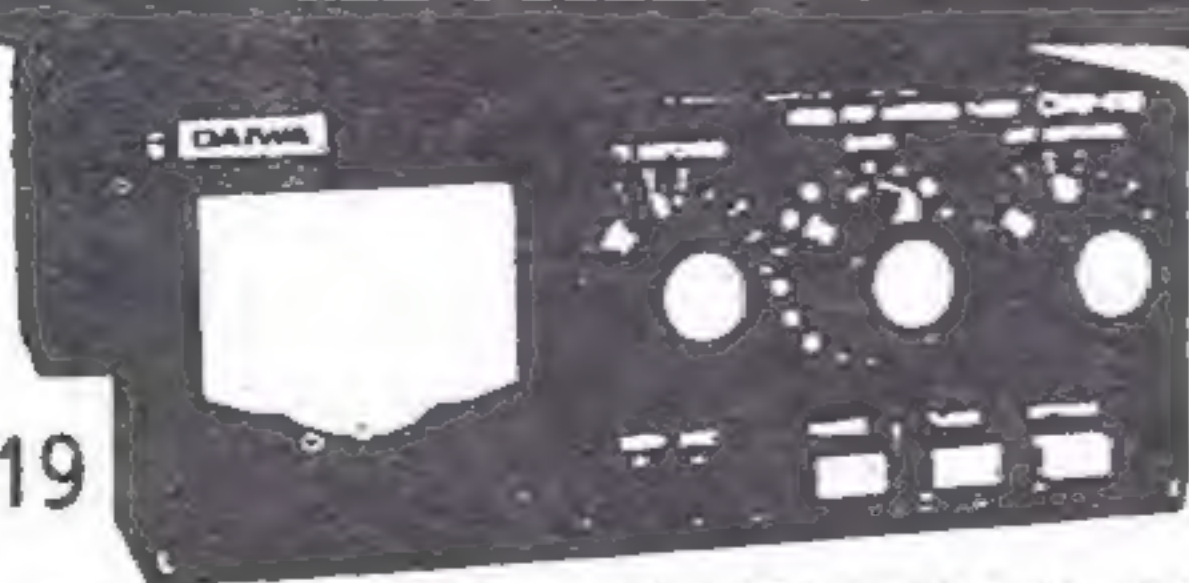
CS-201 2 position-----\$ 39.95	CS-201G with N Connector\$ 59.95
CS-401 4 position-----\$119.95	CS-4 4 pos BNC Con SALE-\$ 29.95

#### ANTENNA ROTATORS:

MR-750PE with preset-----\$499.95	MR-750E incl 1 motor---\$449.95
MR-750U extra motor-----\$149.95	UP TO 4 MOTORS MAY BE USED.....

AF-606K Active Filter PLL--\$179.95	DK-210 Keyer with Meter--\$129.95
CNW-419 Antenna Tuner+520--\$379.95	←200W CW 1.8-30MHz Continuous.

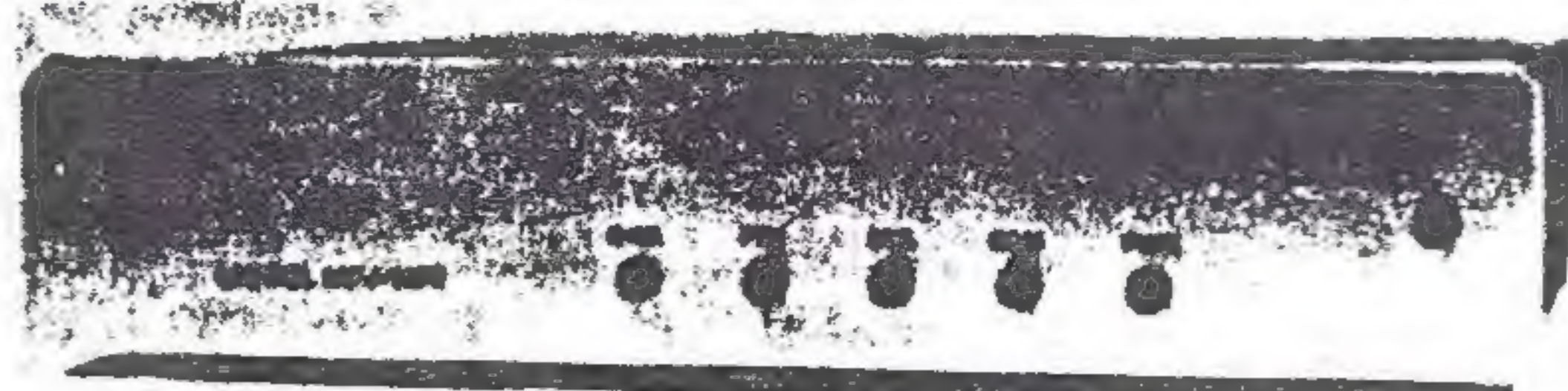
CNW-419



## AFFORDABLE PACKET RADIO

An identical TAPR TNC 2 clone with a new cabinet and added features

MFJ-1270 \$ 229.00



Join the exciting packet radio revolution and enjoy error-free communications ...

MFJ brings together efficient manufacturing and TAPR's (Tucson Amateur Packet Radio) leading edge technology to bring you affordable packet radio. You get a nearly identical clone of the widely acclaimed TAPR TNC 2 with identical software and hardware. It's in a new cabinet and includes a TTL serial port for extra versatility.

All you need is your terminal program. If MFJ's optional Starter kit is added, everything you need is included (1283 (tape), \$39.95). Unlike machine specific terminals being obsolete because of hardware change. You can use appropriate terminal programs. Updates will be made available. 56K bauds are possible. Machine specific TNC or widespread use. You can use the latest Data Carrier. It features the latest Data Carrier. Join the packet radio revolution today. MFJ-1270 today.

## MICROPATCH™ Computer Interface

SUPER CLOSEOUT SPECIAL

\$ 199.95



12VDC Adaptor  
add \$15.00

### HARDWARE FEATURES

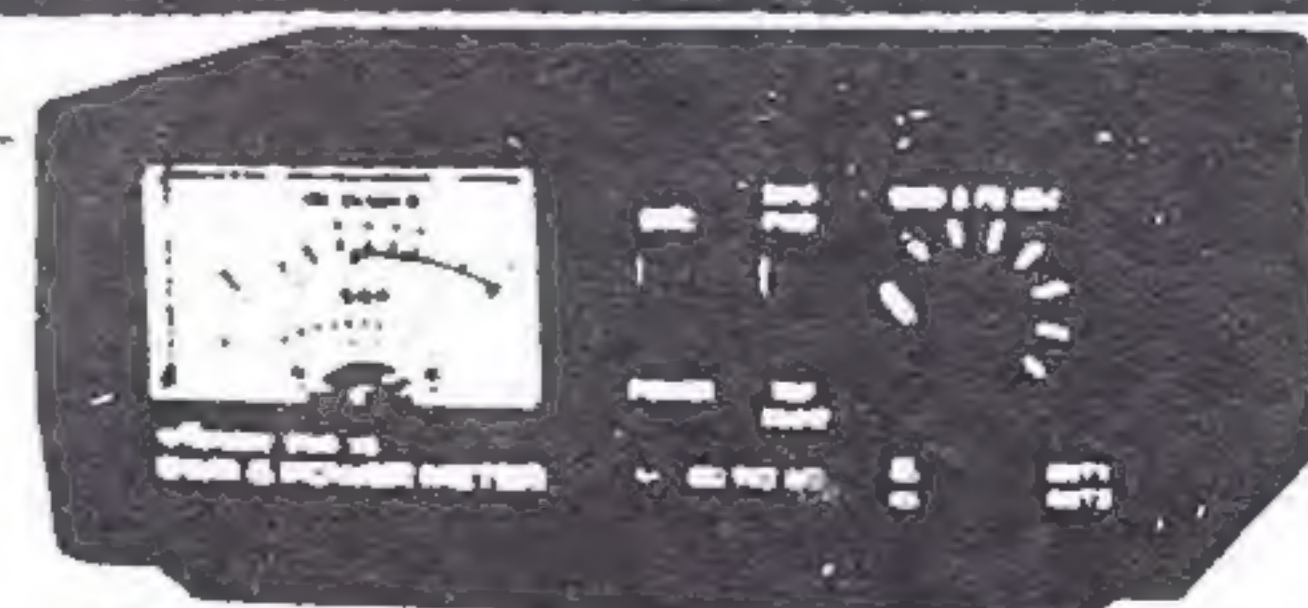
- Easy hook-up to transceiver;
- True multi-stage four pole Chebyshev active dual-channel filters for Mark and Space;
- Automatic threshold correction circuit (ATC) for good copy when one tone is lost in QRM or selective fading. (Not a low-cost phase-locked-loop detector);
- 170 Hz shift or 850 Hz wide shift for receive;
- 800 Hz multi-stage active CW receive filter;

Get an Interface only \$40 more. MBA-TOR-64 series MICROPATCH MA. You're getting The MBA-TOR-64 used by it.

The MICROPATCH user a complete TOR™ AEA so RTTY, ASCII and The MAP-64/2. The popular Con.

The with keyboard operate from an as the AC-1 (no

- Easy, positive indicator;
- AFSK sine wave
- FSK output;
- Plus or minus
- Automatic PTT
- Scope outputs
- Operates from drain on host c



SWR POWER & FS METER  
MODEL SWR 35 \$59.95

This model is a compact through line type Power SWR & FS meter designed for the wide frequency range measurement for the amateur radio station. Equipped "On the Air" LED light up in accordance with the output power. Reversible two antenna systems or antenna and dummy load by easy switch operation.

Specifications	
Impedance	50 - 52 ohms
Frequency Range	3.5 - 150MHz
Power Range	0 - 20, 200W - 2 ranges
SWR Measuring Range	1.1 - 1.3
Punctual Power	3.5 - 30MHz (HF Band) 200W 50 - 150MHz (VHF Band) 50W 100 LA F S D.
Meter Sensitivity	M Type (S) 2391 1 x TX, 2 x ANT
Connector	150(W) x 65(H) x 70(D) mm
Dimensions	400 g
Weight	Par Antenna 1pc.
Accessory	

**Hansen**  
BOTH HAVE LIGHTED  
METERS WITH 12VDC

### SWR POWER METER

MODEL FS-55 \$

This model is an easy to use model consist of independent 50 - 52 ohm coax cable, watts and SWR meter for "On the Air" LED light up

Specifications:  
Frequency Range  
Power Range  
VSWR  
Impedance  
Punctual Power

Connector

Accessories

Dimensions

Weight



## RADIO FROM MFJ

atures ... for an incredible \$229

rig, home computer with a RS-232 serial port and a Commodore 64, 128 or VIC-20 you can use Pack to get on the air immediately. You get interface software on tape or disk and complete instructions to get on packet radio. Order MFJ-1282 (disk) or MFJ-1283 (tape).

ic TNCs, you never have to worry about your MFJ-1270 if you change computers or because packet radio standards change any computer with an RS-232 serial port and an app-gram. If packet radio standards change, software up-gradable as TAPR releases them. Also speeds in excess of 19200 baud with a suitable external modem! Try that with a ma-chine without hardware HDLC as higher speeds come into being also use the MFJ-1270 as an inexpensive digipeater. X 25 Version 2.0 software, hardware HDLC for full du-plex operation, 16K RAM, simple operation plus more. Revolution now and help make history. Order the

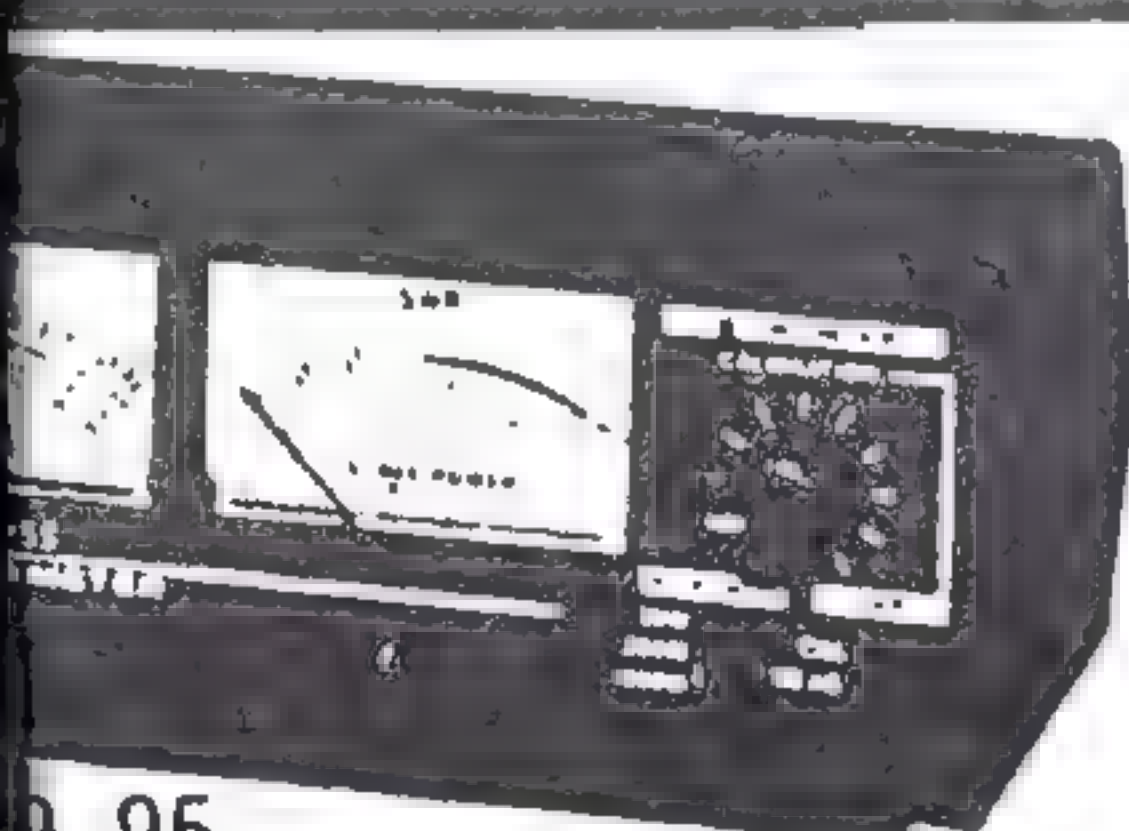
## by AEA SALE!

face with MBA-TOR Software for less than the software itself!!!. The MAP-64/2 for only \$199.95 !!!... an interface for \$40.00 !!!... software portion can also be used with another interface.. MATCH™ Model MAP-64/2 offers the best hardware and full-featured MBA-TOR software package for use in Morse, and AMTOR communication modes. It plugs into the game cartridge slot of a Commodore 64 personal computer.

MAP-64/2 come complete with overlay and operator's manual and an external 12VDC power supply such as the one included).

tuning with triple LED tuning display; CW output keying;

available; user supplied 12VDC (reduces computer)



9.95. This compact Power & VSWR Meter. This Power meter and SWR meter adaptable to any power meter can be measured for 0 - 1000 - 5 VSWR on antenna circuit. Equipped with accordance with the output power.

1.5 - 150MHz  
0 - 20, 200, 1000 watt 3 ranges ±10%  
1 - 15  
50 - 50 ohms  
15 - 30MHz 1000 watt  
50 - 150MHz - 50 watt  
M TYPE (ISO 239)  
Connector cable for illumination lamp.  
Magic Fastener x 2, pcs  
180(W) x 75(H) x 90(D) mm  
800g

## 1986 CALLBOOKS



The "Flying Horse" has a great new look!

It's the biggest change in Callbook history! Now there are 3 new Callbooks for 1986.

The North American Callbook lists the amateurs in all countries in North America plus those in Hawaii and the U.S. possessions.

The International Callbook lists the calls, names, and address information for licensed amateurs in all countries outside North America. Coverage includes Europe, Asia, Africa, South America, and the Pacific area (exclusive of Hawaii and the U.S. possessions).

SHIPPING ON BOOKS \$5.00 ANY QUANTITY..

North American Callbook\$30  
International Callbook-\$29  
BOTH CALLBOOKS-----\$55  
Callbook Map Library---\$12

ARRL 1986 Handbook-----\$26  
1986 Hardcover Handbook\$40  
ARRL Antenna Book-----\$12  
Hardcover Antenna Book-\$20  
Satellite Handbook-----\$15  
FM & Repeater Book-----\$ 8  
Repeater Directory-----\$ 5  
ARRL Tune in The World-\$15  
(The above is with CW Tape)  
Antenna Compendium-----\$16  
HF Antennas for all Locations\$17  
Understanding Amateur Radio-\$ 9  
ARRL Morse Code Kit-----\$14  
Haruteq Ontario Scanner Freq.\$14  
Zbarsky Study Guide-----\$19  
CRRL 600 Questions & Answ.\$10  
CRRL Log Book-----\$3.25  
Radio Database IBE 5.7-25.7Mc\$19  
Radio Database TBE 2.25-5.7Mc\$ 7  
Both Database IBE & TBE\$19  
WORLD RADIO TV HANDBOOK-TBA  
\$29.00

For our store customers we now carry the following:  
QST CQ 73 Popular Comm DX Ontario  
Modern Electronics TCA (CARF)...

## HI-Q BALUN

- For dipoles, yagis, inverted vees and doublets
- Replaces center insulator
- Puts power in antenna
- Broadbanded 3-40 MHz.
- Small, lightweight and weatherproof
- 1:1 Impedance ratio
- For full legal power and more
- Helps eliminate TV!
- With SO 239 connector
- Built-in DC ground helps protect against lightning

Only

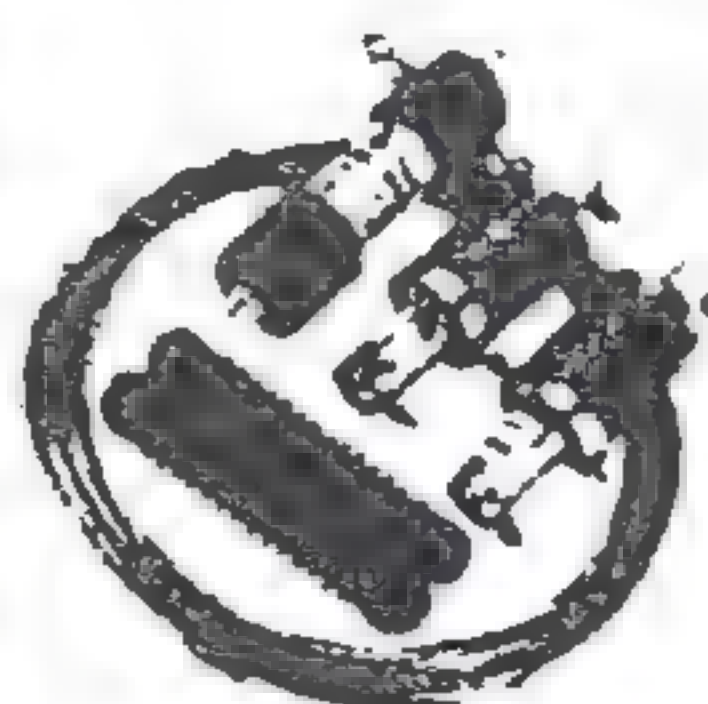
\$19



## 40/80 Meter Antenna Kit For "Perfect Dipole"

Quick Installation — Nothing Else to Buy

Also resonant on 10,15,20M with a Tuner !!



Unadilla/Reyco  
5 Band Dipole  
Kit.

Complete Kit \$125.00

- W2AU 1:1 Balun
- Pair of W2VS KW-40 Traps
- 125' #14-7 Copper Wire
- Complete Installation & Pruning Instructions

W2AU Balun 1:1 or 4:1 specify-----\$35.00  
W2DU Balun 1:1 HF or VHF Specify-----\$45.00  
Unadilla Traps 10 15 20 30 40 80M per Pair--\$65.00  
Insulator (Centre Insulator for Dipole)-----\$16.00  
End Insulators (each)-----\$ 5.00  
AW-150 14 Gauge 7 Strand 150' Antenna Wire--\$29.00

## SWR/Power Meters YAESU

Frequency Range 140-525 MHz  
Measurable Power Range 0-200W  
Meter Full Scale Ranges 4/20/200W

Power Meas. Accuracy ± 10% of full scale

4W Range: ± 5% of full scale

20/200W Ranges: subtract 10% 1/s

Note: 220 - 420 MHz: add 10% 1/s

450 - 525 MHz: 4 watts

Minimum Power for SWR meas. 1.0.1 to infinity

SWR Measuring Range

Insertion Loss: less than 0.1 dB

140 - 250 MHz: less than 0.2 dB

400 - 470 MHz: less than 0.3 dB

525 MHz: 50 ohms

Input/Output Impedance 50-239

Input/Output Connectors 120 x 72 x 85mm

Dimensions (WHD) 540g (19 oz.)

Weight

The new YS-60 and YS-500 are handsome, compact, multi-function instruments for monitoring both average and peak transmitter power output and reflected power, and voltage standing wave ratio (VSWR) of antenna systems in two-way radio stations from 1.6 to 60 MHz (YS-60), or 140 to 525 MHz (YS-500). The small size and color coordinated cabinets make these ideal additions to any Yaesu transceiver. Three functions provide monitoring of either forward or reflected average transmitter output power for CW, AM, FM and FSK modes, or peak envelope power (PEP) for SSB modes, and VSWR for testing and monitoring the performance of transmitting antenna systems.

Frequency Range 1.6-60 MHz

Measurable Power Range 0-2 kW

Meter Full Scale Ranges 20/200/2000W

Power Meas. Accuracy ± 10% of reading

(add 5% of reading between 1.6 and 3.5 MHz)

Minimum Power for SWR meas. 3 watts

SWR Measuring Range 1.0.1 to infinity

Insertion Loss: less than 0.1 dB

1.6 - 60 MHz: 50 ohms

Input/Output Impedance 50-239

Input/Output Connectors 120 x 72 x 85mm

Dimensions (WHD) 680g (24 oz.)

Weight 13.8V DC @200mA

Power Requirements



YS-500 \$129



YS-60 \$159

Insured Shipping & Handling - Please add 2% (\$5 Minimum) to all orders. Some items are subject to freight collect..... Visa / Mastercard accepted at slightly lower discounts..... ONTARIO RESIDENTS - ADD 7% SALES TAX AFTER ADDING SHIPPING. PLEASE SEND 2 - 34¢ STAMPS FOR CATALOG & INFO REQUESTS..... NOTE: ALL PRICES SUBJECT TO CHANGE WITHOUT NOTICE..... SPECIAL PRICES BASED ON CHEQUE WITH ORDER. CREDIT CARDS ARE ACCEPTED AT SLIGHTLY LOWER DISCOUNTS - USUALLY ABOUT 5%..

## ATLANTIC HAM RADIO LTD.

Tues.-Fri. 10 a.m.-6 p.m.  
Saturdays 10 a.m.-2 p.m.  
After 7 p.m. Call (416) 222-2506  
For Orders.

378 WILSON AVE.  
DOWNSVIEW, ONT.  
CANADA M3H 1S9  
(416) 636-3636



## Hearing Is Believing!

be plainly heard. It will be apparent by now that the oscillator unit must be rigidly constructed.

The most basic power supply is all that is required to power this project, and no need was found for voltage regulation. It operates best with a supply voltage of approximately 16 volts. Fig. 4a shows a suitable circuit with a 12.6V power transformer. In my case I was unable to find a 12.6V transformer that would fit into the small case I was using, but I did have a 6.3 V transformer that fit nicely. Fig. 4b is the voltage-doubling rectifier circuit that I used to get the required 16 VDC.

In addition, all signals generated by this unit can be heard on an ordinary broadcast band receiver placed nearby. This is useful should it be necessary to fiddle with the value of the padding capacitor across C1. I found 10pf to be ideal in this unit, but different coils may require slightly different values. Without a frequency counter to assist, you can look for the signal on the broadcast band receiver to see if it is too far above or below 1 MHz, and adjust the capacitor accordingly.

Strong broadcast signals appearing near 1 MHz actually enhance your ability to hear signals from the oscillator as the heterodyne can be heard clearly on the broadcast receiver.

### ADDITIONAL THOUGHTS

This unit as it stands is extremely sensitive, and in many applications a reduction in sensitivity may make it easier to use. The solid slug used in the coil may be substituted with metal of a smaller diameter. If smaller diameter metal is used, steps should be taken to ensure that it remains centered in the core. I suggest using a piece of bakelite or fiberglass rod with the centre drilled out. A piece of small metal rod or wire can be inserted into the hole that has been drilled. This assembly is then attached to the end of the feeler. This will produce smaller changes in tone for the same change of position of the slug in the coil. In addition, the number of turns on the coil, and the value of the capacitance

can be altered to change sensitivity. The slug movement uses only a small portion of the total length of the coil, and changing the starting position of the slug in the coil will yield altered sensitivity. This is because most of the broadcast coils are wound so that the turns-per-inch ratio of the coil increases from the slug-out position to the slug-in position. The least sensitive range of the coil will be in the "mostly out" region. Obviously you will have to experiment a bit with slug construction and position to find the range that best suits your requirements.

This presentation should be considered as a progress report and feasibility study to which final comments and suggestions will be added in a later issue.

I wish to give credit to Jim VE3BME who was the prime mover behind this

project. The idea was his, and he supplied the machine shop expertise necessary. He is, and will continue to be, the official "constructive criticizer" of the operation of the unit, and his enthusiasm was contagious.

JIM EADIE - VE3DCX

*[These two amateurs have provided an interesting project. Your comments are invited - Please direct them to Jim Eadie, R.R. #2, Tweed, Ontario K0K 3J0 -- Ed.]*

### INPUT NEEDED FROM READERS

Comments on matters relevant to our hobby, your personal experiences as a ham, photographs of hams 'in action' are welcome. Please send them to **Ray, VE3BAK, 7 Doncliffe Drive, Toronto, Ontario M4N 2E5.**

### MEMBERSHIP NEWS

Libby, VE3IOT, advises of the following new members:

VE3OLY	Stuart Liversidge, Thornhill
VE3NHI	Bruce Clark, Parry Sound
VE3UL	Herb West, St. Catharines (won the membership prize at Milton)
VE3NYA	Stan Carter, Burlington
VE3OIX	Lea Leslie, Hamilton
VE3OIZ	William Leslie, Hamilton
VE3OXX	Rick Francis, Richmond Hill - idtimes in June)
VE3LIK	Herman Klebanoff, Willowdale
VE3OQR	Róbert Banner, Fisherville
VE3PIA	Hugh Schatz, Toronto (Was VE3074)**

The following is up-to-date information on call signs and addresses:

VE3OR	Croft Taylor. New call is VE3CT. Address is Box 2-1, R.A. 3 Pine Ridge Rd., Carp, Ontario K0A 1L0
VE3JKE	Charles Owston. New Call is VE2RO.
VE4ZS	Sid Lipkowitz, 145 Marlee Avenue, #1712, Toronto M8B 3H3

The following amateurs are now at a new QTH as shown:

VE3GRO	H. Maclean, 500 Riverside Dr., London N6H 2R7
VE3NDI	Ron Counsell, 138 York St., St. Catharines L2R 6E7
VE3FPF	Rev. L.A. Purdy, 11 Alexander St., Brampton L6V 1H7
VE3KPF	Bernard Marcoux, R.R. #1, Alliston L9M 1A0

\*\*This is a number assigned by RSO to non-licenced members by RSO. We welcome the new members to RSO and hope that they will benefit from their association with us. Please feel free to share your experiences and knowledge with your fellow hams via the pages of this magazine.

To those who have moved, we trust that the new QTH will prove to be ideal for ham radio.



## PLAY IT SAFE

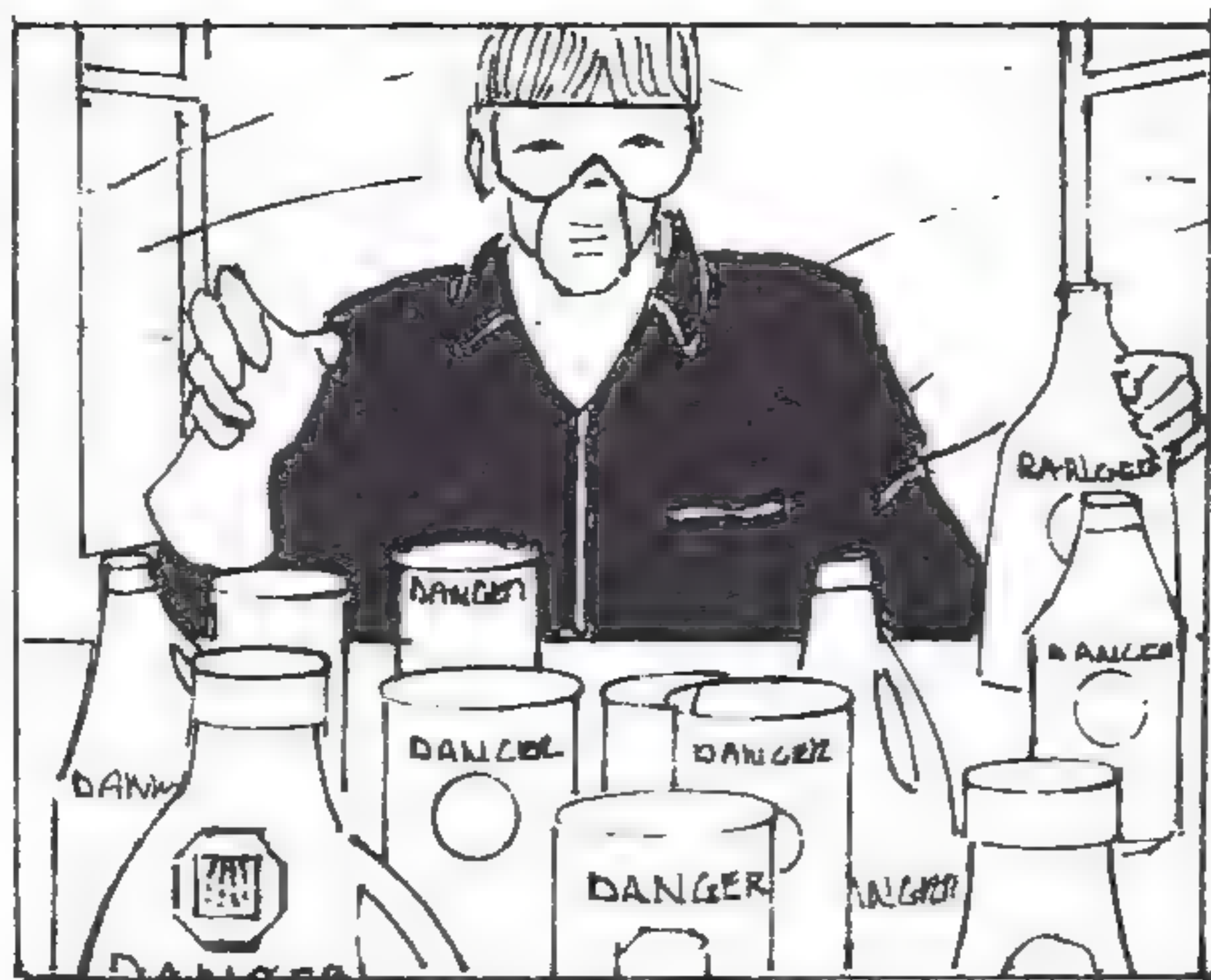
by Jim Eadie, VE3DCX

It should be understood that some of the chemicals used for photo-etching are corrosive and may cause personal injury or damage to property if improperly or carelessly used. I would suggest that you should purchase a pair of rubber gloves and eye protectors and wear them especially during the handling and mixing of any of the chemicals, or while using them. This is very inexpensive insurance in case of accidental splashing or spilling.

The household lye used for developer is corrosive. Once it has been mixed to developer strength it is not particularly strong; however, it may cause skin reactions if handled with bare hands. Be sure and follow the mixing directions carefully as it does react violently when mixed with water, and the mixture can become very hot. Mix only in a glass container as plastic may melt where the lye drops to the bottom and dissolves.

Ferric chloride deserves more comment. This chemical is extremely corrosive and can cause injury to exposed skin, and serious damage to metal objects. Again, follow the mixing instructions carefully as it also reacts violently when mixed with water. Due to the heat generated by mixing use ONLY a glass container for mixing, and use and store the chemical only in a glass or plastic container. Ferric Chloride is an excellent dye, and will permanently stain almost anything it contacts. Be cautious when disposing of the used chemical. Do not pour into a metal sink. If your plumbing system uses metal drain pipes be sure the chemical is well diluted with water and flushed down well. If you decide to pour it down the toilet, flush the toilet first and pour the chemical into the swirling water so that the bowl does not stain. Then flush again to ensure the chemical is all flushed and well diluted.

When storing the dry chemical, make sure that it is placed into a non-metal airtight container. The powder absorbs moisture rapidly out



of the air. The mixed chemical should also be stored in a non-metal airtight container.

Please note that if you are using the bubble etch method, the chemical has a tendency to spatter about the immediate work area. Either cover the dish being used, or place equipment in a clear area that is well covered with newspaper.

In addition, if heating this chemical to speed up its reaction, do not heat it to the point where noticeable evaporation occurs. Ferric Chloride at room temperature gives off little or no fumes, but if overheated (evaporation occurs at a rapid rate) the fumes can be overwhelming. The fumes will be very noticeable causing burning of the eyes and throat, and difficulty in breathing! NEVER leave Ferric Chloride that is being heated, unattended.

The sensitizing laquer and the nail polish remover also deserve comment. These materials give off rather strong fumes and should be used under well ventilated conditions. Both are very flammable and should not be used in the presence of open spark or flame. DON'T SMOKE!

All of these chemicals can be used very safely as long as the user is aware of their dangers and reasonable care is exercised in their use and storage. Please read all label instructions carefully, and understand them first. Then follow them carefully. When you have finished using them, find a safe place to store them where they cannot be reached by children, and where they will not freeze.

Good luck. I am sure you will get excellent results. As you will note, the cash outlay is minimal, and the equipment required is very basic.

'73, Jim.

## EMERGENCY COMMUNICATIONS SUPPLIED FOR LYNDHURST HOSPITAL

During a power failure on December 10th, 1985, and for several days and nights thereafter, members of the Thornhill Radio Amateurs Club provided 2 metre assistance to Lyndhurst Hospital. This hospital services physically disabled persons and the cellular telephone installed as a temporary measure was not adequate during peak periods during the day.

VE3IOT, Libby, arranged for a 2 metre station to be installed at the hospital. A number of emergency calls were handled via the autopatch on VE3TTY and the hospital personnel were extremely grateful for this service.

Members of the Thornhill Club volunteering their services were: Harry Kiddie, VE3LLR; Herman Klebanoff, VE3LIK; Rick Francis, VE3OXX; Kevin Dwyer, VE3OXE; Earl Bolton, VE3MVJ; Libby Stevens, VE3IOT; Jack Corbett, VE3EYG; Bob Simpson, VE3ODR.

Additional volunteers, not members of the Thornhill Club were: Bryan Biller, VE3OYN; Will Melhuish, VE3AOY; Ron Russell, VE3AMW; Michael Pecore, VE3MZH (patient); Ray Pellowe, VE3BAK.

## SILENT KEYS

We regret to report the passing of the following amateurs:

VE3LK	Jack Harris, Toronto
VE3MFU	Cliff Lockwood, Apsley
VE3EV	Arthur N "Shem" Lecheminant, Brockville
VE3EQG	Robert L. "Bud" Miller, North Bay
VE3OC	Tom Yates, St. Catharines
VE3JTW	George Fennel, Hamilton
VE3AIU	Fred Bissett, Goderich
VE3TX	Lou Stonehouse, Havelock
VE3EUJ	Jim King, Strathroy

Our sincere condolences to their families.



## PHONETICS

From SPARC-GAP, January 1986

Back in the earliest days of radio, the use of phonetic alphabets was unnecessary, because communications modes such as spark and CW do not, by themselves, easily lead to possible confusion between letters. It was the introduction of telephony ("phone" which pointed out the need for some acceptable means of clarifying letters as sent and received, especially where names of the letters sound similar: "B" and "D", "S" and "F" are examples. There are others, of course. The use of phonetics, then, is intended as a means of facilitating accurate transmissions. The applications are fairly obvious: when signal paths are noisy, when mistaken identifiers could lead to inconvenience or even danger, when one's hearing is not as good as it should be, and when contacting persons who do not share a common tongue fluently.

In recognition of the great value of such systems, a number of phonetic alphabets have been developed over the years. I would guess that up to the end of the second World War, the phonetics of the United States Army were probably the one most widely known in the English-speaking world. It was based on words familiar to most Americans, and chosen so that they were clearly differentiated aurally. It later became apparent that the universal application would require words that were separable by speakers and listeners who were neither American nor users of English as a primary language. The present alphabet, as endorsed by the International Telecommunication Union and the International Civil Aviation Organization should be familiar to you.

A	ALPHA	N	NOVEMBER
B	BRAVO	O	OSCAR
C	CHARLIE	P	PAPA
D	DELTA	Q	QUEBEC
E	ECHO	R	ROMEO
F	FOXTROT	S	SIERRA
G	GOLF	T	TANGO
H	HOTEL	U	UNIFORM
I	INDIA	V	VICTOR
J	JULIETTE	W	WHISKEY

K	KILO	X	X-RAY
L	LIMA	Y	YANKEE
M	MIKE	Z	ZULU

Remember that, like CW, this is a **SOUND** form of communication. Certainly, you might be asked on an examination to write down an acceptable alphabet, but its value and effectiveness is as sound. This efficiency is seriously compromised if these phonetics are pronounced incorrectly. Most of the letters are straight forward for those of us who know English or the Romance languages of French, Spanish, Italian (and Romanian).

But watch out for these:  
**KILO** is pronounced "Kee-low" with a long "ee" sound, as in common usage in European languages.

**LIMA** follows this rule, too. "Lye-ma" refers to a bean and a city in Ohio, in North America, but hardly anywhere else.

**PAPA** carries the accent on the second "aw" syllable.

**QUEBEC**, of course, comes out as "Kay-bec".

The alphabet is a means to facilitate communications. It is not an end in itself. Use the one in common usage; cutesy "Victor Echo Zee-ro Silver Plated Succotash" may be witty, and different, and unintelligible to a DX operator. Also, there are occasions where phonetics are neither necessary nor desirable, as when you are full-quieting into the repeater, or when repeats and fills are not requested in traffic nets. Don't use phonetics when the meaning is universally clear: you would not say, "Thanks for the Kay-beck Sierra Oscar, old top", would you? Well, Would you?

(tnx once again to the  
Metro Bulletin of October 1985)

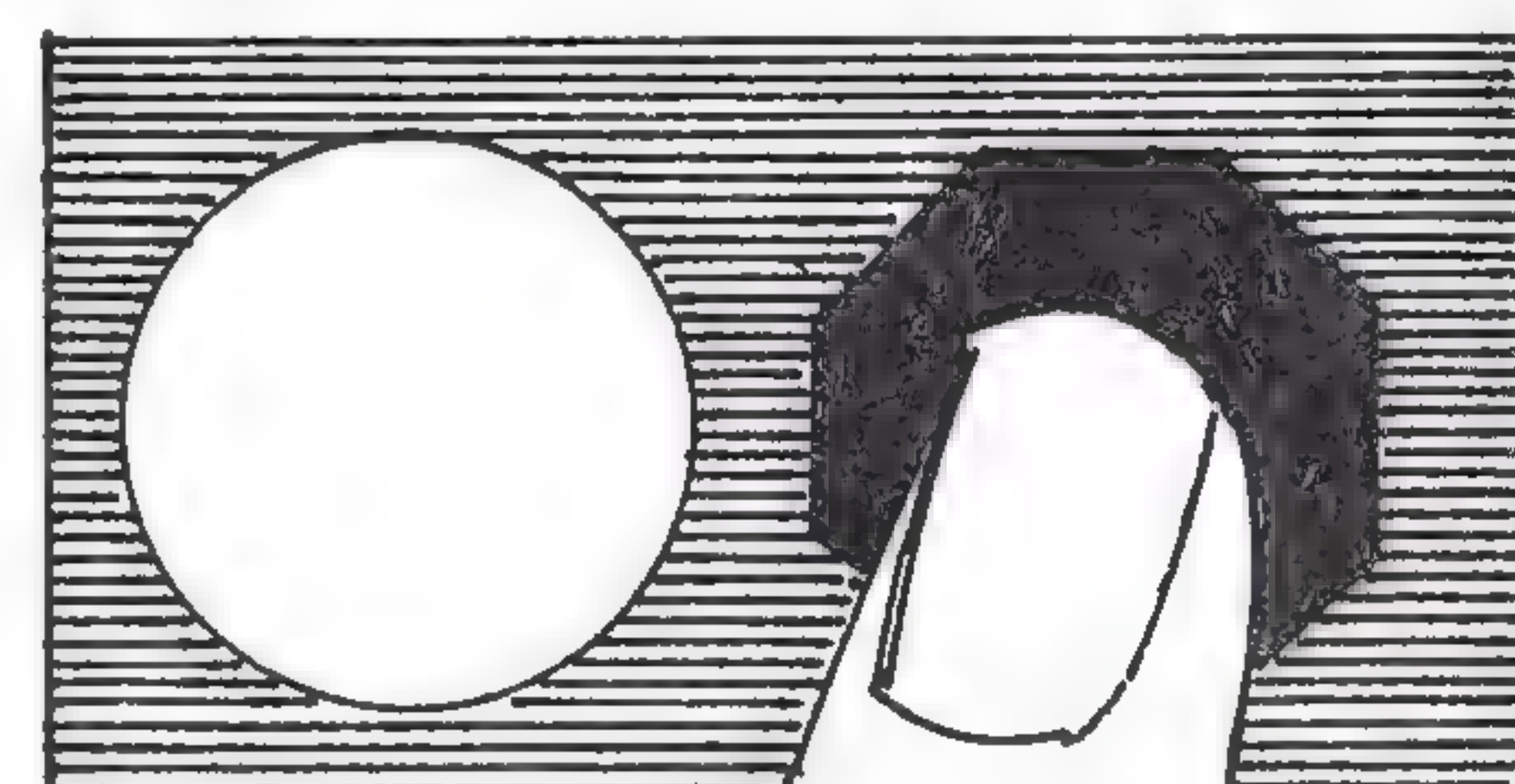
## STOP THE PRESS NEWS!

### ANNUAL OLDTIMER'S REUNION

**Date:** Tuesday, June 17, 1986  
**Place:** Orillia, Ont., at Champlain's Monument in Couchiching Park, on the shore of beautiful Lake Couchiching in the heart of Huronia.  
**Time:** 2:30 p.m.  
**Dinner:** 5:15 p.m. at the Sundial Motor Inn, just five minutes drive from the park. Prizes galore and raffles for shore! After the dinner there will be lots of daylight for your drive home.  
**Tickets:** \$13.00 per person until May 1. \$14.00 per person after May 1. (to cover cost of meal and private dining room).

In the event of inclement weather, there is a large covered pavillion with picnic tables right next to the monument in the park.

Each year our annual reunion gets better - could it be because of all the lovely ladies? (Last year 25 attended!). Everyone will enjoy an eyeball with old friends and meet new ones



to eyeball with again next year. We'll have a group picture taken on the steps of the Monument, and our roving photographer will be taking individual pictures, all of which will appear in various newspapers and magazines.

After many years of organizing the Annual Oldtimer's Reunion, Bruce VE3BC has turned over the happy chore to Ding VE3ATK. Contact Ding for further info.

Better still, make your reservations now. Send \$13.00 per person to:

Bob "Ding" Dunn VE3ATK  
318 Short Ave.,  
Woodstock, Ontario N4S 4B1

Remember! Your remittance must be postmarked or received by May 1st. If there are any reservations open after that date it will cost you and extra buck!



# QUARTZ CRYSTALS

## INTRODUCTION

Since its incorporation in 1973, LESMITH has been known for its extensive knowledge of crystal requirements for amateur, commercial, and military equipment. We maintain data on old and new models, and we are willing to work with you on any requirement, commercial or experimental.

Most of our work is with repeat customers, for whom our regular delivery is 3 weeks on average for custom crystals. We offer a rush service to our regular customers at no extra charge. However, where delivery is requested in just a few days, and very special attention is needed, we may request a premium price.

## HOW TO ORDER

Give us at least the information suggested in the sample order below. If we need more information, we will request it. In most cases, this is enough to proceed.

QTY.	XTAL FREQ.	T/R	CARRIER	MAKE & MODEL Additional data
1		T	146.340	INoue IC22
1		R	146.940	"
3		T	157.845	GE Royal Exec
3		R	152.585	"

## PRICING

If the pricing is obvious, total the amount, add \$1.25 for First Class mail, and send in your money order, or cheque, with the order. If there is any doubt about the formula and or price, send in the order without the money. We will price the order and inform you by return mail. In the meantime, your order will be processed and shipped on receipt of your payment.

In the example, the amateur band crystals are \$8.50 each, and the custom or commercial crystals are \$9.95 each. The total is \$76.70 plus \$1.25 = \$77.95. Ontario residents add 7% Ontario sales tax.

## 1986 PRICES

**AMATEUR** EACH  
Amateur bands 8.50

**CUSTOM**  
6 - 55 MHz 9.95

### Above Ranges Cover Most Sets

1 - 2.0 MHz	19.10
2 - 3.5	16.00
3.5 - 5.9	13.15
55 - 90	13.15
90 - 100	19.10

Temp. Compensated Crystals 13.80  
MPI Crystals 12.10

Below 1 MHz, and above 100 MHz, price available on request.

**MODULES**  
Mocom 70 25.80  
Mocom 35 22.70

**REWORK MODULES** to new frequency  
General 21.60  
Hybrids (MT500, MX300) 37.00

### COMMON HOLDERS MIL Designations

These holders accommodate the majority of requirements.



Approximately  
3/4 x 3/4 x 5/16  
HC-6/U .050 pins



HC-17/U .093 pins  
HC-33/U wire leads



Approximately  
1/2 x 3/8 x 1/8  
HC-25/U .040 pins  
HC-18/U wire leads

The above holders accommodate the majority of requirements.

Commercial customers should call for volume prices.

*Lesmith Crystals*

LESMITH LIMITED

P.O. BOX 846, 54 SHEPHERD RD., OAKVILLE, ONTARIO, CANADA L6J 5C5  
TELEPHONE (416) 844-4505 TELEX: 06-982348

Phone or write for more information





## GENERAL INFORMATION ABOUT CAR BATTERIES

from SPARC-GAP, JANUARY 1986

Most gasoline powered vehicles and equipment use storage batteries to provide current for cranking, ignition, lighting and accessories. In addition, batteries are sometimes used as a source of motive power.

The electric storage battery is an electro-chemical device that converts chemical energy into electrical energy and holds it in storage. It stores the electrical energy until needed to start the car or when the engine's alternator is not producing sufficient electrical power for the accessory load. The amount of electrical energy that a battery can store and deliver is its "capacity," which increases as the amount of material in the battery increases. Using electricity from the battery is called discharging, a process that reduces the battery's stored power. Putting current into the battery is called charging. Charging a battery is done by applying a greater voltage across the battery terminals than is reduced by the battery.

### BATTERY ELECTRICAL RATING:

Though many specific electrical ratings have been used over the years, two relatively new ratings, developed in 1971 by SAE and BCI, are now in use by virtually all U.S. manufacturers. The principal indicator of battery performance level is the Cranking Performance Rating, which represents the battery's potential ability to start an engine. The second indicator is the Reserve Capacity Rating.

### CRANKING PERFORMANCE RATING:

The primary function of the storage battery is to provide power to crank the engine during starting. Cranking involves a large discharge in amperes (current flow) upwards of 500 amps with larger engines . . . over a short span of time. Cranking requirements increase sharply as temperatures fall. At 0 degrees F, it takes about 2-1/2 times as much power to crank the engine as it does at 80 degrees.

Unfortunately, battery capacity is also greatly reduced, since the chemical reaction is slower at low temperatures. At 0 degrees, a battery delivers only 60% of its 80 degree rated capacity. The Cranking Performance Rating (BCI) and Cold Cranking rating (SAE) are based on established testing methods to determine the minimum battery output in amperes. BCI defines the Cranking Performance Rating as the discharge load in amperes which a new, fully-charged battery at 0 degrees F can deliver for 30 seconds and maintain a voltage of 1.2 volts per cell or higher.

SAE's similar rating calls for tests at both 0 degrees F and at -20 degrees F. Both ratings (BCI and SAE) are expressed in "CCA's", or cold cranking amps. The rating can be used quite effectively for selecting the proper electrical size within a given group size.

### RESERVE CAPACITY RATING:

The second of the newer ratings, the Reserve Capacity Rating, represents the approximate time in minutes it is possible to travel with battery ignition and minimum lighting and accessory load, but without generator input.

As defined by BCI, the Reserve Capacity Rating is the time in minutes that a new, fully-charged battery at 80 degrees F can be discharged at 25 amperes and maintain a voltage of 1.75 volts per cell or higher.

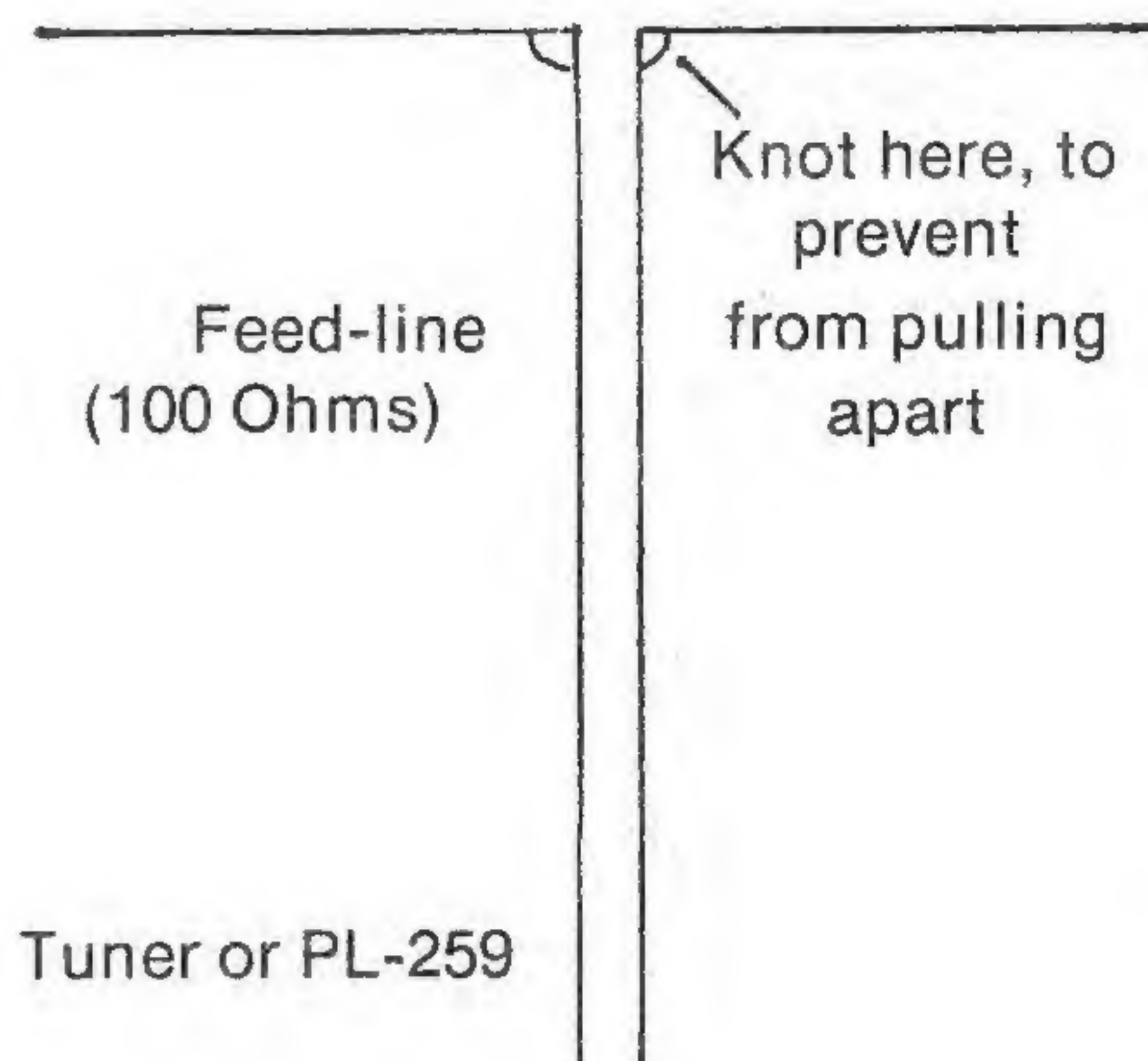
### A LAMP-CORD ANTENNA (from the Niagara Peninsula Amateur Radio Club FEEDLINE of October 1985)

Here is an antenna that can be used in about five minutes, and is ideal for portable use, such as field day, or a camping trip. This is not an original idea, (there are a few of those left) but it is noteworthy. It's cheap and it works. That's important these days!

My antenna was cut for about the middle of the forty metre band. I purchased 21 metres of lamp-cord, and then split the cord to form a

dipole and a feed-line. The actual length of the antenna was about 19 metres. This is a bit less than the textbook length for a centre frequency of 7.180, but remember that this antenna was slung between two trees at the breath-taking height of 5 metres.

Split to desired length, as needed.



This antenna will work directly into your HF rig, and form a system with a fairly low SWR, but I don't recommend using it in the city without a tuner, unless you hate your neighbors and want to risk the DOC coming to your door. But with a tuner, many interesting possibilities are opened. You can cut an extended Zepp, (which is about 29 metres for 20 metres) with a built-in feed line, if you have the space. The only catch is that the loss is high in this material at frequencies above 10 Mhz, so keep the feed-line as short as possible on the shorter wavelengths.

Does it work? I operated portable as, NK80/8 from near Sault Ste. Marie, Mich. during August, and successfully kept skeds (on CW) with Eric, VE3ISD, and Mario, VE3GMA in St. Catharines, also a sked with John, WA30VD, in Harrisburg, PA. (With thanks to Eric ISD for relaying a change in frequency to John through the traffic nets.) With limited operating time, I also worked stations from Cape Cod to Missouri. Not bad for a \$5 antenna and a Die Hard Battery!

(submitted by  
Charles W. Powell, VE3OCF/NK80)



## YOUR HELP IS NEEDED

### Your magazine needs photographs!

The best kind to be reproduced are in sharp focus, black and white, preferably jumbo size.

Most of us have exchanged photos with other hams. Some pictures of foreign DX operators must be available that we could borrow for a short time. A photo of you and your shack would be of interest to those who hear you on the air on a regular basis. A photo of your station, then and now, or a pictorial record of a trip or anything involving amateur radio would be welcome.

If you would care to contribute a story about some of your experiences in this hobby, please do not hesitate. Your contribution may be what is needed to spur someone to decide to enter this fascinating pastime.

## TAKE MOTHER NATURE SERIOUSLY

Your editor recently received a letter-tape with photographs from VK7RN, Ron, in Tasmania.

It wasn't very long ago that Ron and his XYL, Jean, were awakened by a violent thunderstorm. This occurred at 6 a.m., and Ron immediately went to his shack and disconnected his ham gear and electric organ.

At 6:10, a tremendous clap of thunder was heard and a particularly bright flash of lightning was seen. Ron's neighbour saw a lightning bolt travel along the telephone lines which resulted in the neighbour's wall-mounted telephone being blown off the wall, leaving a great hole in the plaster. The same lightning bolt destroyed Ron's computer CPU, his disk drives, Printer and modem all of which had been forgotten in Ron's effort to save his ham equipment. The same event ruined the heating unit of the waterbed, and stopped Ron's electronic wrist watch. The lightning strike which caused this and other damage (to neighbours) actually occurred about 200 feet behind Ron's home.

So, when you hear thunder .....

## NEW HORIZONS

### Ooops - we goofed!

Our comments in the last New Horizons column, page 17 of the last issue of The Ontario Amateur, are not correct. In this, we state that a reduction in power of a transmitter to one-half will make a difference in received signal strength of one S unit. We are wrong. It is really one-half S unit.

Our argument in the column is correct, except that we forgot that a reduction in power to one-half reduces the voltage not to one-half, but to one over the square root of 2, since voltage is proportional to the square root of power (from  $P = E^2/R$ ). This means that a reduction of 3 db in power, or to one-half, results in a reduction of 3 db also in S meter voltage, or one-half S unit.

Hence, the arguments in our earlier letter are even stronger. The Argosy will produce a signal only one-half S unit lower than that of an HW12/32, or equivalent transceiver, not one S unit as previously stated. All the more reason to get on the band wagon and get an all-band Argosy rig through CNIB. To date (December, 1985), we have orders for 20 of them.

73,  
Bill Loucks, VE3AR  
Fred Roberts, VE3AFA

## TO INTERESTED ONTARIO AMATEURS

RSO is not in competition with CARF or CRRL but, on the contrary, hopes to support the work of those national bodies.

The effectiveness of any organization or society is directly proportional to the percentage of the total group its membership represents. All Amateurs are enjoying the benefits of the work of such groups; not all are lending their support by being members.

Will you support the RSO? The cost is small, the benefits are many. Come on, be a joiner. Do it today!

73,  
RAY VE3BAK

## SOME HOPE YET

Taken from "Working Women" London Free Press - December 28, 1985

Dear Sam: Can I give some advice to the women who is driven crazy by her husband a ham radio nut?

Dear Driven Crazy: I am sorry that you are feeling fed up with your husband. Mine is a radio fan, too, and I want to tell you that you should hang in there. At least you know where he is all the time.

My husband has been doing it for 20 years and it is the best hobby for later years - - although when the children were small he sometimes forgot he even had them! Tell your husband his call sign is VE3EUX (Norm). Perhaps we could become friends.

Mrs. Lawrence

## COMPUTERS ??

Over the next year we are going to publish information on computers as they apply to amateur radio. If you have any programs for say the "64", please send them to us for publishing.



## YOUR NEW EDITOR

Ray Pellowe VE3BAK is retired from the School of Optometry, University of Waterloo, where he was a professor.

Ray and his wife Shirley, have five children and two grandchildren. Two of his sons are amateurs; Bruce VE3LLX and John VE3FRQ.

Ray's other interests include photography, playing the organ, swimming and travelling. Chief complaint; "not enough hours in the day."



# More kit quality

A triumph of price and performance — Heath's new HW-5400 Synthesized HF SSB Transceiver kit makes high technology affordable. With more versatile, far-reaching capabilities, it puts the original skill and adventure back into Amateur Radio...



HW-5400 Transceiver

control when used with the Split Memory function. The matching HWA-5400-1 Power Supply/ Speaker & Digital Clock (not shown) provides a double-fused source of 13.8 VDC from 120 or 240 VAC.

Heath breaks the price barrier on sophisticated transceivers, offering the highest value for your hamshack dollar. The slim, new HW-5400 is a marvel of kit-form engineering that performs like a dream on 80-10 meters.

## MORE ADVANCED IDEAS

Solid state and broadbanded, the HW-5400 incorporates more performance-improving features at a lower price than any comparable transceiver. It's fully synthesized for crystal stability and accuracy. Operating in USB, LSB and CW with automatic sideband selection, it has full break-in (QSK) for proficient keyers, two memories per band, power supply activation at the Transceiver, defeatable amplifier relay, reverse and over voltage protection as well as high VSWR forward power cut-back circuitry for the finals.

A custom microprocessor yields flexible, fingertip control over all phases of T/R operation.

## MORE CONVENIENCE

This perfection-packed kit has many benefits. A unique dual-speed tuning system can extract new QSOs or fly through a band in 1 kHz increments with 50 Hz resolution! *Split-Memory Access* lets you review and change the transmit frequency while in receive, without missing a single word or fragment of code. With it, you can beat the QRM every time. Essential vox and sidetone controls are located behind the front panel nameplate. Seven mode and function symbols confirm transceiver status at a glance.

The HW-5400's Frequency Entry Keypad option allows directly-synthesized QSY to any point in the band, and permits fast DX

## MORE ENJOYMENT

Novice or active pro, the HW-5400 is perfect for operators who want a Transceiver that's second to none, plus the pride, knowledge and satisfaction that come from building it yourself with our world famous step-by-step manuals. You may find it to be the first microprocessor-controlled rig with enough potential to match the level of professionalism in every radio amateur!

## MORE DETAILS IN CATALOG

**FREE!** For complete details and specifications get a copy of the latest Heathkit Catalogue.



**WRITE:** Heath Company, 1020 Islington Ave., Toronto, Ontario M8Z 5Z3. Visit your nearest Heath/ Zenith Computers and

Electronics Centre, listed below left, for an exciting hands-on try-out.

## There's more for the Ham at Heath

Also see our State-of-the-art SS-9000 Deluxe HF Synthesized Transceiver (pictured below), which can be controlled by a computer or ASCII terminal.

Visit your nearest **Heath/ Zenith Computers and Electronics Centre**. Our Centres, located in Vancouver, Calgary, Edmonton, Winnipeg, Mississauga, Ottawa and Montreal sell, display and service the complete Heathkit product line.



**Heathkit®**  
Heath  
Company